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FIELD-MARSHAL H.R.H. THE DUKE OF CAMBRIDGE, K.G.,
G.C.B., &c., &c., President, in the Chair.

(H.R.H. the PRINCE OF WALES was present at the meeting.)

IMPERIAL FEDERATION—NAVAL AND MILITARY.

"You know that if there is one thing more than another that I hope to live for and take part in politically, it is that, before I die, I may see the British realm a realm extending all the world over, and her children whom she has sent out themselves self-governing communities, united together in a bond of peace that shall be an example to the world."—Extract from Speech, delivered August 1, 1885, by the late W. E. FORSTER, M.P., First Chairman of the Imperial Federation League.

By Capt. J. C. R. COLOMB, formerly R.M.A.

IN the time allotted it will be impossible to do more than sketch the outlines of the subject. Before proceeding to do this it is necessary to review general considerations in order to avoid confusion if not dangerous misconceptions. The main features of Imperial Federation are—

1st. The unity of the Empire.

2nd. The developments necessary to preserve it.

The first is based on the present universal acceptance of the declaration that it is to the mutual material advantage of all parts of the Empire to be united.

We have here the expression not merely of a patriotic sentiment, but a direct reference to practical utility. Sentiment is a great force, but its strength for practical purposes is in proportion to self-interest. Mutual advantage is the strongest bond, and the measures most calculated to secure the permanency of the Imperial Union are those which best foster and promote common benefits conferred by that union.

In discussing Imperial Federation from any point of view there is danger of confusion between the end sought to be accomplished and the means by which that end can be attained. The end sought is not the adoption of one particular plan or scheme for the transaction of such affairs of the Empire as are of common concern to all its parts. It is something much more simple—the strengthening of Imperial Unity. The means to secure that end are such constitutional develop-

ments of the Imperial civil, naval, and military machinery as are necessitated by progress and growth, and are by mutual consent acknowledged to be for mutual advantage.

Imperial Federation has to do with facts—commercial, political, naval, and military facts—and not with the theoretical construction of a “brand new Constitution” for the Empire. Walpole tells us that when Lord Holland was asked by an Italian Minister to draft a Constitution for the little State of Naples, he replied, “You might as well ask me to build a tree.” The Imperial Federationist does not propose to build trees, but he points to what have been long ago planted, and asks for a recognition of growth and that demands of development shall be satisfied.

Let us now briefly examine what it is we have planted; what has been the extent and nature of its growth; and what are the demands of a naval and military character made by the development of these interests, which war forces may be required at any moment to preserve.

What we have Planted.

Our flag has been planted in territories beyond sea by three distinct processes—conquest, cession, and settlement. Some portions we owe to the sword, some to diplomacy, others to the natural overflow of population. Those who think that Empire means war need to be reminded that out of eight and a half million square miles of British territory, only about one and a half million square miles have been directly acquired by war or by diplomacy. Some seven million square miles represent the proportion contributed to our Empire by the pursuits and enterprises of peace. Industrial and commercial progress has won for us some seven-eighths of our Empire. It has also created new liabilities, introduced novel conditions, and accumulated responsibilities which must be met if the unity of the Empire is to survive in war. Keeping to the special subject before us it may be said that what we have in three distinct ways planted, are new maritime and territorial conditions of British defence.

It is to be noted that the great bulk of our territory acquired by conquest or diplomacy lies in the tropics and sub-tropics. Here we have to deal with dense populations ever on the increase, and with varieties of races in every stage of progress or decay. Here also we have to deal with climatic and other conditions which forbid all prospect of the natural growth and expansion of our own race ever being really localized. These limbs of Empire, for prosperity, for protection, and for peace depend upon the strength of our influence and power. The main source of that strength must be drawn from centres of civilization which has its only permanent abiding place in the temperate zones. For protection from external attack or foreign intrigue, and for security against internal anarchy, they depend upon military and administrative means furnished from without. As component parts of our Empire their relations to the rest are the relations of the numerically strong to the numerically weak, yet of the governed to the governing power. These territories form in the aggregate an Empire of Dependencies, and in Table I (Plate XIX)

will be found a general statement as to some facts of its present conditions. It includes, as will be observed, India, the West Indies, Possessions on the West Coast of Africa, the Straits Settlements, Hong Kong, and very many other isolated positions which are in the true sense of the term dependencies, though not necessarily in the tropics or sub-tropics.

Turning now to other portions of the Empire which lie almost wholly in the temperate zones—the Dominion of Canada, Newfoundland, the Colonies of Australasia and those of British South Africa, in these the characteristic features completely differ from those presented by the Empire of Dependencies.

In British North America and Australasia populations are yet so small in proportion to area that they may in that respect be said to be at present infinitesimal. We have there but a residuum of aborigines gradually disappearing before the advance of civilization by a natural process of absorption or decay. In Canada there is a considerable population of French origin, but thoroughly loyal to the Crown. British South Africa presents circumstances of an exceptional character. There we have aboriginal races numerically immensely in excess at present of European population. The European population itself contains a preponderating proportion of Dutch origin, loyal to the Crown. In all these territories the backbone of the population is Anglo-Saxon. The populations there owe their presence to that spirit of energy and enterprise which led men and still leads them to "*home away*" from the Old World to the New. In every one of these territories climatic conditions and all circumstances favour the unrestricted growth and practically unlimited expansion of our race. Were the thirty-six millions of people crowded together in these two small islands of ours spread over the habitable portions of those territories they would still be but very sparsely populated. For internal prosperity and for progress these Colonies mainly depend upon themselves, not upon us. They look to increase of population by natural growth, and to immigration of "*bone and sinew*" from the Old World, to ensure for them a great and glorious future under the old flag. For the maintenance of social order they no longer require the guidance or the assistance of the mother country. Canada, with special internal difficulties, without any parallel in Australasia, has recently shown she needs no external help to suppress rebellion and re-establish law. Such military means as are necessary for the security of internal order are furnished from within, not from without. The relations of these component parts of the Empire to the mother country are the relations now of numerically weak to numerically strong distributions of one and the same people. They are not the relations of the governed to the governing power, but of absolute freedom based upon the common attributes of political, social, and moral equality. Our Colonies are tied to us by loyalty to the same Crown, the forces of a common sentiment, and by a sense of present mutual advantage. The bonds may be permanently injured or for ever destroyed by a war for which neither the Colonies nor we were adequately prepared.

These territories in the aggregate make up the Colonial Empire respecting which some useful information will be found in Table II (Plate XIX).

What we have planted then beyond sea may be grouped under two distinct heads, the Empire of Dependencies and the Colonial Empire. One is the artificial product, the other the natural offspring, of the Home Empire of the United Kingdom.

Table III gives, for purposes of comparison, similar information relating to the Home Empire, as already given for the other two.

A summary of all three is shown in Table IV.

The tenure by the Home Empire of the Empire of Dependencies is that of administrative capacity and of power. The association of the Colonial with the Home Empire is that of kinship, consent, and a common loyalty to a common Crown. The existing connection between the Colonial Empire and the Empire of Dependencies is through the Home Empire of the United Kingdom. They form together a trinity of strength or of weakness precisely in proportion to their power of combination for common security. That power must develop fresh strength in the ratio of the demands and necessities of growth. In other words, it depends upon the furthering now and in the future of all such measures as shall increase mutual advantages in peace, and secure organized co-operation for mutual defence in war. These are briefly the principles of Imperial Federation. They are applicable alike to political, commercial, naval, and military considerations. The recognition of their importance must precede practical action, and the realization of the influences and the facts of growth is the first step towards that recognition.

Let us now therefore briefly examine—

The Nature and Extent of Growth.

For purposes of illustrating growth it is necessary to fix standard dates. It is fitting to take as one the present time, when products of our Empire are gathered under one roof in London, and subjects of our Queen are flocking together from all parts of the world-wide dominions of the Crown. For a past date, I select the period of the great International Exhibition of 1851. Thus we shall measure during the past thirty-five years broad facts of British progress at home and abroad, such as population, trade, shipping, and revenue. Table V shows the condition of the three great divisions of our Empire in 1851. I dismiss area as evidence of growth because during this period we have not only acquired fresh territory, but have also parted with it in Europe, Africa, and North America.

For purposes of rough illustration let us take the United Kingdom on the one hand, and the whole outlying Empire on the other, and compare at these two dates—1851 and the present time—the one and the other.

Table VI so compares the population, trade, shipping, and revenue then and now. The broad lessons it teaches may be summed up as follows:—

1st. That the aggregate year's trade of the outlying Empire now

exceeds by over one hundred millions sterling the total value of the whole trade of the United Kingdom only thirty-five years ago.

2nd. While one year's trade then (1851) of the United Kingdom was nearly treble the value of the aggregate annual trade of the Empire beyond the sea, it does not now exceed it by even 50 per cent.

The movement of shipping in and out of port furnishes a standard also of relative interest on the seas and oceans of the world. The diagram illustrates these main facts:—

1st. That in 1851 the aggregate tonnage entering and clearing British ports at home was more than double the aggregate tonnage entering and clearing British ports abroad. Now, however, it will be seen the tonnage entered and cleared our ports abroad in the year is greater by some 13,000,000 tons than in the case of our ports at home. I remind you that this excess alone is about the equivalent of the total tonnage in and out of all our home ports during the year of the Great Exhibition, 1851.

Here, then, we have the creation by natural growth of new, great, changed, and changing interests requiring protection in war.

Upon readiness, sufficiency, and combined action of Fleet and Army this vast trade for its security in war entirely relies. Upon its safety depends not merely the wealth and greatness of the British Empire, but its power to lead onward and undisturbed in the civilization of the world. Upon the adequate protection of Imperial trade in war will depend not merely the comfort but the *bread* of scores of millions of toilers geographically separated by seas but under one flag. The original sources of material power of defence are men and money. Diagram VI shows not only the growing and changing interests we may have at any moment to defend, but it also indicates increase and changing positions of the material resources of dormant defensive power. The possession of such original resources as men and money is one thing, however, while their proper adaptation and sufficient appropriation for purposes of defence is another. As regards the simple fact of their possession this diagram shows—

1st. That, roughly speaking, during the last thirty-five years there has been an increase of the Queen's subjects at home of nearly 10,000,000, while over-sea the addition amounts to nearly 40,000,000.

2nd. That in 1851 the annual revenue of the United Kingdom was nearly double the aggregate revenue of the Empire beyond sea, while now the aggregate revenue of the Empire beyond sea exceeds by 22,000,000*l.* sterling that of the mother country.

Such, then, are a few broad features of these comparisons. There are many others of importance I now pass by, the subject being large and the time of explanation short. Having hastily examined what we in the past planted, and having glanced at the nature and extent of growth, let us now take a general survey of some other changes which have occurred.

It is necessary to note without remark those constitutional changes, due to Colonial growth, occurring since 1851, so far as they affect arrangements for defence. Canadian Provinces have combined and formed one great Dominion, spreading from the Atlantic to the

Pacific, with one Parliament initiating and controlling measures for its local defence. It has joined the oceans by railway communication. Newfoundland possesses a separate Parliament, charged with providing for its local defence. In South Africa there is also now a Parliament, exercising the same functions over a portion of that territory. At the Antipodes there are six separate Parliaments possessing similar powers of arrangement for the defence of six separate portions of Australasia. I merely add to this bald statement that it is quite at the discretion of these nine Parliaments, in combination with our own, with each other, or separately, to provide means of defence for these great common interests which lie beyond their shores.

While the common interests of the Empire and Parliaments have been growing, science has been busy revolutionizing the mode and means of war. The changes it has accomplished may be here sufficiently described in a few words. In the first place, it takes almost as many years now to build war-ships and great guns as in bygone times it took months. On the other hand, the use of arms of all branches of the Service in the past could be picked up in a hurry, and even during a campaign. The scientific weapons now demand long and elaborate training; in short, broadly speaking, what science has done is to enable rapid and decisive results to be produced in war, but *only* by long previous preparations and the development during peace of an organized system and plan. Effective and successful defence will therefore wholly depend in war upon the elaboration of organized arrangements and provision of means during peace. These cannot now be improvised when the time for their application has arrived. The necessary naval and military arrangements between the several parts of the same Empire to secure common safety for the common interests must be made and *paid for* in peace. They cannot be postponed until danger arises without peril. Science and systematic preparation have usurped the former places of sentiment and enthusiasm in determining the issues of war. Wealth and natural resources are nothing but temptation to attack, if their reasonable and sufficient applications to the purposes of their defence be denied.

There is a further consideration to which I must refer.

While industry and enterprise in British lands in all quarters of the globe have been swelling the value and volume of our common sea commerce, war navies have been created and naval power has been developed by nations which thirty-five years ago were not—could not be—regarded as maritime Powers. Military stations and naval bases have been established by other Powers on oceans and seas not then but now of huge Imperial importance to us. All this is only natural, only what is reasonably to be expected, but nevertheless they are facts which, as regards British defence, must not, cannot be ignored.

These broad considerations concern not simply the United Kingdom, but all territories, all industries, all manufactures, all interests, and all peoples under our "one flag." They make up a union of common war-risks against which general insurance must be paid and joint precautions taken. They can only be met with success by co-operation

and joint action between the several parts of the Empire upon a settled system and a developed plan. I am referring chiefly to British sea trade, and for the present exclude other interests from comment. In doing so, however, it must be remarked that with certain exceptions—prominently that of India—the frontiers of our Empire are practically sea frontiers. As a rule, the protection of our sea commerce is virtually the protection of our territories. Trade is territorial in its source and origin, though maritime in its main operations of exchange. I may mention in passing that the sea trade of India alone is about equal to that of Russia. It is worthy of attention that during 1851 the trade between the United Kingdom and India was officially stated at about 17 millions sterling; it is now some 86 millions a year. Thirty-five years ago the annual trade between Australia and India was in value only 150,000*l.*, it is now over three millions in value a year. The trade of the mother country has therefore five times, and that of Australia twenty times as much interest in the security and prosperity of India as they had thirty-five years ago. The territorial security of India is therefore of ever-increasing importance to the industrial and commercial classes at home and in Australia. This remark can be shown to generally apply to almost all parts of the Empire as regards India and each other. I mention these facts to avoid a possible misconception that the protection of British trade and commerce is simply a question of securing sea communications. The sources of supply must be guarded as well as the freedom of flow secured. It is helpful to a real conception of Colonial growth to remember that Australasian trade alone at this moment equals that of the Empire of Russia. The total trade of that great Empire was in 1851 but two-thirds of the total trade of Canada to-day. The aggregate sea trade of the Colonies and dependencies at the present time exceeds by some 50 millions a year that of France and Russia together. These are great maritime Powers, but our Colonies and Dependencies, with a greater aggregate of sea interests to be protected, could not produce as many armed and efficiently manned boats as these two Powers can vessels of war.

All operations of war—by land or sea—may be resolved into three original elements: place, time, and force. The places necessary to occupy are fixed by geographical circumstances. The nature and strength of the forces required are determined by the character of the places to be taken or held. Time is the factor that rules the necessities which organization has to fulfil by the production at the right places, at the right time, the right force. This very elementary statement of course applies as much to certain latitudes and longitudes on oceans and seas as to territorial positions. Sea commerce passing over the water areas of the world is governed by physical laws. The direction, volume, and value of its constant ebb and flow, so to speak, are regulated by the laws of supply and demand. Now the whole operation of protecting our sea trade is covered by two main propositions—

1st. The keeping in of the ships of the enemy that are in port when war breaks out.

2nd. Forcing all other vessels under a hostile flag off the sea, either into port or to the bottom.

The masking of hostile fleets by promptly placing, on the outbreak of war, off their war ports, the force necessary to keep them in, is an essential condition of safety of the commerce not only of the mother country but of each and all parts of the Empire. It is a joint necessity which must be provided for in order to secure reasonable safety for the whole. The fleet which keeps that of the enemy in port in one hemisphere is really protecting commerce in the other. The Colonies and dependencies for the security of their commerce will in war be as dependent as the United Kingdom on British naval power being equal and adapted to the discharge of that fundamental duty. While our commerce has been growing and foreign naval power has been developing, science has been changing the conditions of blockade: torpedo defence has benefited the blockaded, while reliance on steam, which is reliance on coal, has diminished the staying power of ships engaged in blockade. Ships outside a port must keep up steam by emptying their bunkers up their funnels. Meantime these ships will be losing speed by the natural process of fouling of immersed surface. Thus, in order to coal and in order to clean, they must constantly leave the offing, and while away their place must be taken by others. The net result of such considerations, here only indicated, is that the growth of our sea trade has made efficient blockade more imperative, while science has made that operation more difficult and more costly. The magnitude of the sea interests of the Colonies and dependencies alone demand that the necessary means shall be sufficient and available for this purpose. Our outlying Empire with over 400 millions' worth of goods on the sea in a year, is most directly concerned in the locking up of hostile fleets on the outbreak of war. Is it neither to share the cost of providing the means nor the duty and the honour of applying them to the purpose of securing its own safety? Our people at the Cape, in Canada, or Australia, are as patriotic as our fathers were when Jervis and Nelson, for the salvation of England, maintained famous blockades and fought their great sea fights. It is well to remember that the trade of British North America and South Africa together now, is about what the trade of England was when St. Vincent was fought; and that the sea commerce of Australasia alone exceeds by tens of millions the sea trade of the United Kingdom when Nelson triumphed at Trafalgar.

Now as to the other branch of operations for the defence of sea trade. Though we may blockade hostile war ports, still some of the enemy's war fleet will probably be already at sea—steamers will escape from his mercantile ports or elsewhere, armed for attack on our maritime or territorial interests. The main difference between blockade and the more extended operation of clearing the sea of hostile ships is—that in the one case our objective points are fixed points—the enemy's war ports—in the other they are ships with power of rapid locomotion. Sudden changes of position at sea and the probable absence of any clue whatever as to the direction

and objects of those changes are the chief circumstances to be met by the defence arrangements of our Empire. The power of a fleet or vessel to attack or defend interests on the high seas is in proportion to its freedom; the limits of a steamer's freedom at any point on the high seas are the coals in the bunkers *less the quantity* required to carry her to the nearest port where she can procure a fresh supply; her movements are ruled by coal-carrying capacity in relation to speed; speed is reduced by the fouling of immersed surface and general wear and tear; loss of speed is equivalent to a reduction of coal-carrying capacity, and consequently to restriction on, liberty of action.

As regards time and place, therefore, the freedom of a nation's fleet, squadron, or ship depends primarily upon the number and general distribution of national ports available for coaling, docking, and refitting. That freedom, however, is absolutely destroyed if such ports are not secured from attack wholly independently of seagoing ships. The first necessity, therefore, to the freedom of our fleet is the local and military defence of all British ports of importance at home and abroad. The chief measures to adopt in war to force hostile vessels off the sea is to employ sufficient means to make their access to their own mercantile ports, to which ocean steamers can resort, hazardous; and also to observe closely similar ports under a neutral flag.

What the naval and military organization of the Empire has to provide for, in order to secure the common commerce of each and all its parts, is the protection of these various places on the outbreak of war, the right forces to do this varied work. The safety of that commerce will entirely depend upon the promptness with which it is done. The Empire's ability to do this work quickly is a question of co-operation between its several parts involving joint expenditure, common naval and military reserves of force and of supplies. These must be adapted to, and available for, general service for the defence of our common sea trade; the interests of one are the interests of all; the duty of one is the duty of all.

The fullest freedom being secured for our seagoing forces, the next consideration is their distribution on the ocean; that must be mainly determined by the natural distribution of Imperial commerce on the high seas. The seagoing force required to protect a sea line of communication varies with its length. The longer the line, the greater the *number* of vessels necessary to protect it. The offensive or defensive *power* of the individual vessel is a tactical, but the *number* and class of vessels is a *strategical* problem—speed affects both. The importance of the line is determined by military considerations and by commercial facts. Since 1851, a process has been going on which must be noticed, having a commanding influence on the distribution of our naval force. In that year the United Kingdom drew about two-thirds of over-sea supply of wheat, wheat meal, and flour from European ports—the total amount of such food imported was some twenty-three million cwts.—the total quantity we now import is nearly treble what it was in 1851, and only about one-fifth of the whole now comes from European and Mediterranean ports. The sources of such supply have shifted across the Atlantic, and even to the other hemi-

sphere. This extension of the food lines of the mother country is equivalent to a reduction of naval power available for other services. Food lines must be made safe whatever else happens, and for this special purpose a large proportion of our maritime means must be set apart. The increased length and increased reliance on our food lines over-sea necessitates an increase of naval means to ensure their safety, unless other naval duties are to be left undone.

But in 1851 only one-fortieth of such supply came from British possessions abroad, while now the proportion is about one-fourth of that total.¹ Development of the infinite food-producing capabilities of our Empire beyond sea really corresponds to an increase of our defensive power. It may for the above reason be considered as part and parcel of the question how to secure a maximum of safety with a minimum of naval expenditure. Its solution lies in the increase of population in our own Colonies and the cultivation of our own lands over-sea. Co-operation between the mother country and the Colonies to produce this result, would be of infinite advantage to both.

The relative values of different water districts of the world to the several parts of the Empire are shown in Diagram VII (Plate XX, see also Plate XXI). It is only necessary to explain that the geographical limits of the ocean districts into which the diagram divides the world are as follows:—

North Seas Districts.—On the west by a line drawn from Dunkerque towards the Pole through Dover, the eastern boundary being the seaboard in the German Ocean and the Baltic Sea.

North-East Atlantic District is bounded on the west by 30° meridian W., on the south by the Equator, and on the east by the continuous seaboard from where the Equator strikes the West Coast of Africa to Dunkerque where it meets the limits of the North Seas.

North-West Atlantic District includes all the North Atlantic Ocean west of the 30° meridian.

South Atlantic District includes the seaboard of British South Africa with the Atlantic Ocean lying south of the Equator.

Indian Seas District takes in the water area enclosed by the continuous coast line from the north-east of British South Africa to Singapore, thence by a line, including Java, towards the South Pole and back to Delagoa Bay.

North Pacific District.—All the Pacific north of the Equator between the Indian Seas District and the American Continent.

South Pacific District.—All the Pacific south of the Equator between these limits.

These districts are also shown by dotted lines and seaboard on the map—the diagram and the map must be studied together. It is impossible now to attempt to deal with a great variety of considerations, but a careful examination of the diagram will present considerations, be it remembered, which determined the principles governing the distribution and the amount of naval and military force. I can do no more at present than indicate some of them, to show that some

¹ The most remarkable and satisfactory feature of this change is the extraordinary increase of imports from India.

form of Imperial Federation for purposes of mutual defence is *now* essentially necessary for common safety.

At first sight it may be thought that the relative value of foreign trade of the United Kingdom (A) in the North Sea and the two North Atlantic Districts entitles—for that sole reason—these districts to priority of protective precautions over all the others. It may also be thought from this first section of the diagram that the importance of our trade declines in value in the ratio of the distance of the districts from England.

From Section B it will be seen that the foreign trade of the outlying Empire is pretty equally distributed, except in the case of the South Atlantic and North Pacific.

Section C shows that the trade of the United Kingdom with the Empire over-sea is greatest with our seaboard in the Indian Ocean. On the other hand, Section D shows interchange between our possessions abroad to be greater in the South Pacific district than in any other. When, however, the last section showing the whole distribution of British trade is examined, it would still seem as if British trade to foreign seaboard in the districts nearest England was of the greatest value.¹ That is quite true as regards a state of peace, but may not and is not likely to be true when we are engaged in war. This diagram shows the relative distribution of the Empire's trade in peace, and an outbreak of maritime war would entirely change the character of the peace distribution it illustrates.

Serious danger can only arise to our sea commerce from war with a Power having seaboard within the limits of the first three districts in the diagram, *i.e.*, the North Sea, the North-east Atlantic, and the North-west Atlantic. Such Powers are the largest contributors to the foreign trade of our Empire in those three districts. The effect of war would, before a gun was fired, reduce the foreign trade of the Empire in one or more of these particular districts, by the exact amount of previous interchange between the Empire and the Power or Powers thus becoming hostile. Thus, then, the relative value of near as compared with distant ocean districts will be wholly changed. By this cause alone the commercial value of the districts of the North Seas and North-east Atlantic, *viz* A, might fall at once to half that shown in the diagram; while that of the North-west Atlantic might fall as suddenly 90 per cent. Whatever maritime war may occur, the result must be an immediate increase of the relative values of the South Atlantic, Indian Seas, and North and South Pacific districts. These three last-named, the farthest from the United Kingdom, are, we must remember, separated from it by half the world, and communicate with it by three routes:—the Suez Canal, the Cape, and

¹ This diagram does not show accumulations in the various ocean districts. For example, the whole trade of the United Kingdom with all the world accumulates in the waters of the United Kingdom, thus raising the total value of the North-east Atlantic by the value of the trade with the United Kingdom of all other districts shown in the diagram. Nor does it show the accumulation of value produced by the commerce of one district passing over another on passage. For further explanation see my tables, &c., &c., "Naval Intelligence and Protection of Commerce in War."—Journal R.U.S.I., 1881.

Cape Horn. As will be seen from the diagram, the internal trade of the Empire is greatest, but its external or foreign trade is smallest, in these three distant districts. Maritime war must accentuate the commercial reliance of the Empire upon itself, because the loss caused by commercial interchange ceasing between belligerents will seek compensation elsewhere. South Africa, Australasia, Canada, and India are great and increasing factors in the trade operations of the world, and the seaboard of the last three command the waters of the other hemisphere, while South Africa commands one of the three roads which connect them with our own.

It is just because the Pacific and Indian Oceans are so important to us, and because they are so far removed from the mother country, that we must expect attack on our sea commerce will be first delivered there. Circumstances peculiar to this half of the world have a tendency to draw towards it in peace squadrons, and war vessels of all the maritime Powers. There are international interests in Chinese and Japanese waters requiring their presence at all times. It is probable, therefore, that in an outbreak of war, more hostile cruisers will be at sea in the other hemisphere than in this. It is further to be observed that all other water areas of the world together do not present such geographical advantages for attack on our commerce as these three districts. The number of unappropriated islands, the restricted areas over which the world's commerce in those regions at present operates, offer many and great facilities for the establishment unobserved of coaling rendezvous and temporary bases for hostile ships. Our fellow-citizens in Australasia appear to be fully alive to this fact. We and they are too prone to think that the danger can be averted by the simple and cheap process of hoisting the Union Jack on a pole on an indefinite number of islands. It is not, however, the enthusiasm which hoists our own flag in peace that will secure our safety on any sea in war, but the possession of organized defensive war power capable, when the time of trouble comes, of promptly pulling hostile flags down.

By whom and how is that necessary power to be created and maintained? That is really the whole question of Imperial Federation for defence—it is one only to be settled by Home and Colonial statesmen, backed by enlightened public opinion throughout the Empire. We here are only concerned with the strategical naval and military aspects of the Empire's defence. With the civil arrangements necessary to provide the means required for common security we have nothing to do. I would, however, venture once more to repeat my own belief, expressed on many occasions here and elsewhere during the last eighteen years; it is this: that more means are likely to be provided, and that some basis of joint action would probably be settled, if responsible Ministers of Her Majesty's Home and Colonial Governments were brought together in one room and round one table, in order to confer with the responsible military and naval authorities, as to what is necessary to be mutually done for the security of our common interests in war.

As will be seen by a careful study of the last section of Diagram VII

(Plate XX), the aggregate yearly value of the trade of our Colonies and Dependencies in the South Pacific is nearly double the total annual trade of the United Kingdom in those waters. Taking annual value of commerce as a standard, the Colonies and Dependencies are very much more concerned in the safety of the South Pacific districts than the United Kingdom; deficiency in the naval and military means required to protect the trade in the South Pacific would inflict more grievous loss on our fellow-citizens in Australasia than on us. It is a question for them, for Canada, and for us conjointly to determine how the ever-increasing British trade in the Pacific is to be provided with naval and military protection. Most of the chief ports of Australasia are, by local means, secured against sea attack, and thus they are in striking contrast with some of our great commercial ports at home. The money some of these Colonies have spent, the armaments they have provided, and the local forces they maintain, are solid contributions to the freedom of our squadron in the South Pacific. That squadron may be sufficient for the purposes of peace; but can Australasia long remain satisfied with the existing arrangement, which places the reserve of ships, men, ordnance, and ammunition in the North Atlantic, and thus, at the very moment the South Pacific sorely needs them on the spot, they will be at the other side of the world?

The movable reserves of matériel and personnel in Great Britain for use in war are for general service of the Empire, and when distributed and despatched from home to the various stations, the Pacific—owing to its distance—will be the last to receive reinforcement. The delay will thus be greatest where the combined sea interests of Colonies and Dependencies are greatest, and where prompt action is most urgent.

As a short way of supplementing these remarks, I point to Diagram VIII, comparing the trade and revenue of Australasia with that of other Powers having seaboard only in the Pacific Ocean. It is to be remembered that the naval war power referred to in the margin and the war dockyards on which it rests have come into being since 1851. In the interval which has elapsed our Empire, with the greatest stake in the North and South Pacific, has done least to make the power necessary for its protection locally self-supporting in war. Does anybody think—can anybody believe, that a defensive system adapted to the ancient necessities of an island can be effective when that island has grown into an Empire and overspread the world? Those who say off-hand it is so, let them make assurance doubly sure that they are right. Let those who doubt enquire more, and it is the duty of every one who does not think so to do what in him lies to bring about a development of our naval and military arrangements adapted to the necessities of our growth.

I must now briefly and broadly refer to—

Demands of a Naval and Military Character necessitated by Growth.

Seeing the enormous extent of geographical, strategical, constitutional, commercial, and naval and military ground the whole question covers, it will be obviously impossible here to do more than faintly

indicate its salient features. To attempt a detailed survey in the time would be useless if not absurd. Each ocean district and our territories they include have varying characteristics, influencing naval and military considerations. I shall now only attempt to touch lightly upon main principles of general application, and try and illustrate them by reference to the Pacific and Indian Seas.

For clearness of such illustration we will treat the Indian Seas district as a great quadrilateral; its north side being chiefly British territory, and its corners commanded by Aden, the Cape, King George's Sound, and Singapore, the first two dominating two of the three routes connecting one hemisphere with the other. Likewise let us regard the Pacific Ocean as another parallelogram with a huge preponderating proportion of our territory in the south. King George's Sound, Port Hamilton, Vancouver, and Cape Horn at its corners, and commanded by Sydney, Vancouver, Port Hamilton, and the Falkland Islands, the latter position dominating the third water route from the other hemisphere to this. To make divisions so enormous may appear unpractical, but it must be remembered that science has and is overcoming the obstacles of distance in the practical work of the world; that our trade is with all the world, and that the helpless ships we must arrange to protect in war do from 70 to 80 per cent. of the carrying of the world's trade, and that the British sea trade to be guarded is, roughly speaking, in value alone *one-third* that of the whole world's interchange by land and sea. That is the general result of our growth, and if we are to meet the naval and military demands of growth we must not be frightened by their geographical dimensions.

Taking, then, these two great quadrilaterals, there are right places and there will be times when the defensive organization of the Empire must produce the right forces, both naval and military, for the defence of our interests within them. It must not only get the forces there promptly, but be able to sustain them so long as may be required. It will be understood that I now limit my remarks to considerations respecting the naval protection of the high seas and the military security of naval bases, they only refer to the ocean quadrilateral, not to the Indian territories. These considerations I group under three heads:—

War-ships.
Garrisons, &c.
Ordnance and stores.

Taking these in reverse order, let us glance at the necessities of defence in these quadrilaterals in war. It is only by a careful examination of such facts that we can arrive at a conclusion as to whether Federation for Defence is necessary for common safety, and if so on what principle should it be based. Where and how are we to begin?

Ordnance and Stores.

For powder and shot, guns and gun-carriages, and all ordnance

stores, our fleet and garrisons depend on Woolwich and Elswick.¹ Every shot and cartridge used by us in these two great areas must be replaced from thence. British forces in Australasia, a garrison at Port Hamilton, or our frigates off the Horn, at present must rely for these things on workshops on the Tyne and on the Thames. When an extra amount is wanted in the Pacific it will also be wanted in the Atlantic. Pressure, therefore, from all quarters of the world on the outbreak of war will be brought to bear on these establishments simultaneously.

Next comes the question of transport. Munitions of war cannot be exposed to risk of capture or destruction so long as hostile ships are at sea. Precautions must be taken to ensure the sea transit of war stores, hence they must either be escorted by war-ships or sent unconvoyed by the very fastest merchant steamers. If escorted by war-ships, naval force must be reduced elsewhere in order to furnish convoys. In this case the transports must adopt the speed of the convoys, but if the fastest war-ships are so employed, then the general protection of commerce must be left to the slower war-ships. If, however, slow war-vessels furnish the escort, then time will be lost in the delivery of stores. Supposing we rely upon speed without escort; then we are taking from our merchant marine a proportionate part of its best element of safety—speed—and so forcing an increased amount of food and other freights into slower ships, and adding to the risk of capture.

There is an economical question involved even in peace by the facts here referred to. To the cost of production must be added the cost of delivery—the further the destination from the factory the greater the expense. These considerations point more or less all one way, and may be shortly summed up by saying that the artillery requirements of the British positions, maritime and territorial, would be more certainly, promptly, and perhaps more economically met by our having a factory for production of war matériel in the Pacific. Australasia, and the western provinces of Canada both offering natural resources necessary.²

Such extension of local power of producing war matériel, whether situate in Australasia or Western Canada, would be in peace of mutual advantage to us and the Colony in which established;³ and to the whole Empire a source of incalculable strength in war. Self-support of supply of war stores in the Pacific quadrilateral appears to be a first principle on which arrangements for Imperial Federation for

¹ The resources of Indian establishments can hardly be held to be in excess of the territorial requirements of India, and therefore lie outside the question of supply of the maritime wants.

² *Vide* my remarks in "Defence of Great and Greater Britain," in 1880. (Stanford.)

³ The overcrowding of the skilled labour market at home is an increasing economic difficulty. The attraction of the surplus of the old country to the mineral resources of the new, under our own flag, could not but be beneficial were the principle applied of Government contracts to a private firm, such as a Pacific Elswick. Doubtless many contracts for war matériel made by foreign Pacific Powers would fall into its hands, instead of, as now, German, &c., firms in Europe.

defence should be based. It is simply a question of business-like practical co-operation between the Government of Her Majesty at home, and Her Majesty's Government in one or other of these Colonies. Proximity to the Indian seas seems to point rather towards Australasia than Canada as the site for such an establishment. Great things must have small beginnings, and the real danger is delay. If it be argued that this is too big a business to undertake, the reply is, the business to be done in war is bigger. Canada has recently made a small advance in this direction by the establishment of a Government cartridge factory in Quebec; and when trouble came in the north-west, this infant factory turned out in "two months over one and a half million ball cartridges."¹

Garrisons, &c.

Beyond the defended seaports of Australasia and the partially secured ports of India and of Canada, there are many others in these two great quadrilaterals of infinite importance to our fleet in war. About the most dangerous programme for any nation to adopt would be that which would provide for naval bases, armaments, and works, but which did not provide either the number of trained men necessary or the organization required to ensure their being at their posts when wanted. The defence of such ports involves, of course, three arms—the torpedo, the gun, and the rifle. The greater the advance in science, the greater the skill required in the use of weapons. Skill is a matter of training and experience; both cost money and time. If the many isolated ports in these two great areas, and elsewhere, upon which the freedom of our fleet depends have not, on the outbreak of war, the artillery, torpedo, and small-arm force required, the fact of their having works and armament only adds to naval danger. That danger can only be met by the expenditure in peace of money and time for the maintenance and training of the force required to garrison and defend the keys of our sea empire in war. What proportion of such forces may be active or reserve is a question of detail; that there shall be such forces and that they shall be at their posts when wanted, is a principle vital to the security of the commerce of the Empire.

The first point is to get the men.

Second, to train them.

Third, that they shall be available for service *where* wanted, and when wanted.

These three conditions bring us to considerations as to the distribution and the characteristics of the population of the Empire. Diagram IV shows numerical distribution,² roughly as follows: $\frac{1}{3}$ of the whole is in the United Kingdom, $\frac{2}{3}$ being beyond sea. Of the population of the outlying Empire $\frac{2}{3}$ of the total is located in the

¹ *Ibid* Annual Report, Militia and Defence Canadian Blue Book, 1896.

² The address of the President, Sir Rawson Rawson, before the Statistical Society, 1884, will be found, by those not already acquainted with it, an invaluable and admirable guide to statistical information respecting British and Foreign Colonies.

Dependencies, only $\frac{1}{23}$ is in the Colonies. As regards the Dependencies, the table at the foot of Diagram I shows that out of a total of 206 millions, 200 millions are in India; the 6 millions being distributed amongst the West Indies, West Coast of Africa, and isolated possessions in various other parts of the world. Comparing the tables in Diagrams I, II, and IV, it will be seen how enormous is the number to the north of the Indian Seas quadrilateral, and how very few and far between are the populations of the Colonies in the South Pacific, or of Western Canada in the north.¹ But to whatever extent the huge numerical strength of Indian population might or could be used to furnish garrisons where necessary in the Pacific or Indian Seas, the question of artillery and torpedo service is not a question of numbers but of natural characteristics. It needs no argument, it is an obvious fact, that these arms demand, as a rule, the best talents and peculiar qualities of our own race. Assuming that such infantry force as it may be necessary to distribute for the defence of naval bases and ports in the Indian Seas and Pacific might possibly be raised in India,² the question of artillery and torpedo corps remains for consideration.

Where a naval base or coaling station is situated in our Colonies, local population offer the raw material for creating torpedo or artillery corps. At such places it is simply a question of numbers, inducements, and training. I will not stop to examine to what extent the means thus at hand have been made use of at the chief ports of Australasia or Western Canada. The important consideration is the provision for artillery and torpedo service at ports thousands of miles away from either of these seaboard, and where our own race cannot be or is not localized in sufficient numbers to furnish on the spot such corps. It may be accepted as a first principle of British sea defence that there must be an artillery and a torpedo corps and infantry available for general service at coaling ports, &c., throughout the Empire, and sufficiently strong for their needs. If this principle be not fully satisfied by the arrangements of the Empire for its defence, it is not one part of that Empire that will suffer alone, but all. It is a common necessity for the security of our common commerce. In the safety of the Pacific and Indian quadrilaterals, the commerce of our Colonies and Dependencies is first and chiefly concerned. Comparing Home and Colonial populations to areas, as shown in Diagrams II and III, it is evident the United Kingdom must be the chief recruiting ground for the rank and file of such corps. It does not follow that for the defence of our ports in the Pacific and Indian Seas this Island in the Atlantic is a suitable position for trained reserves for service in the Pacific. The argument as to time and transport referred to in the

¹ The population of British Columbia is not at present 50,000.

² This is merely assumed, not by any means intended to be asserted. There are many and great objections, and very wide differences of opinion on this point have been expressed by eminent Indian authorities. Reference to lectures, 1869-1871-1877-1878-1881, Chap. 2 and 3, "Defence of Great and Greater Britain," also "Use and Application of Marine Forces: Past, Present, and Future," Journal, 1883, will explain the views I hold as to garrisons for coaling stations.

case of war stores here points again to Australasia and Western Canada as the proper situation for training schools and depôts of forces intended for such service in those seas. The arrangements for the maintenance of such a force involves joint action and co-operation between the mother country and the Colonies in order to bridge over the chasm in the system of the Empire's defence which purely local forces cannot fill. If it be said when war comes there will be plenty of Volunteers in the Colonies and at Home for general service abroad, I think the answer is—there will be thousands ready to join the Army in the field, but probably a pinnace would hold all the volunteer gunners, or torpedoists, or infantry that would earnestly desire to go to the Falklands, Diego Garcia, Port Hamilton, or Fiji. We cannot trust the keys of security of a thousand millions of sea commerce to patriotic sentiment; its safety in war will depend upon an organized defensive system.

To examine this military kernel of the naval nut would now take too long. The permanent strength of the artillery and torpedo corps necessary for our naval security is not so very great, but for reasons I gave in a lecture here, "On the Use and Application of Marine Forces," its organization, I venture to think, would require to be very elastic, and capable of absorbing in itself Colonial as well as home resources.

Lastly, its Colonial depôts should keep touch with each other, with their outlying detachments in dependencies, and with headquarters in the mother country, forming one force, circulating by periodic reliefs, and interchangeable between the Colonies, the Dependencies, and the mother country, by a tour of duty round the world.

The efficient maintenance of some such force suggests itself as an imperative necessity of our growth, in the satisfying of which all parts of our sea empire are equally concerned. The establishment of depôts and training schools, and the maintenance of a nucleus of a force available for general service at our out-ports in the Pacific and Indian Seas, is surely not more than obvious necessity demands. Some 35,000,000 tons of shipping annually entering and clearing our ports in that water area illustrates the interest the Colonies and Dependencies alone have in their defence. In view of the magnitude of such port-interests, Imperial Federation, naval and military, asks for that necessary, business-like co-operation of the mother country and the Colonies which can alone provide and maintain military guarantees for their security in war, for the common interests and the common good.

War Vessels.

To do full justice to this branch of the subject would require very lengthy consideration. It is only possible now to sketch roughly its boldest features.

Both as to numerical strength and description of vessels, requirements of the police duties of our fleet in the other hemisphere in peace, are wholly different from those to be fulfilled in war. It would be a waste of power and of money to employ in peace ocean cruisers

to discharge the minor but necessary duties of superintending the interests of British trade at the mouths of rivers, and at the multitude of small ports in the Pacific and Indian Seas.

The Officers and men employed in such duties in peace are available of course for service on the ocean in war, but the vessels are not. If, therefore, the vessels suitable for ocean service in the Pacific are held in reserve in our home ports in the Atlantic the outbreak of war will lock up, in vessels which cannot keep the sea, a very large proportion of naval personnel in the Pacific. War cruisers dispatched from home must, during hostilities, have full complements of Officers and men, and thus the arrival of such vessels in the Pacific some two months after they are required will do nothing at all to make available for ocean service the naval force locked up in our Pacific ports. The net result of this system would be, that while the mother country parts with naval reserves in order to dispatch war cruisers to the Pacific, an equivalent portion of the regular naval forces will remain bottled up in our ports in that ocean district, because they have no ships. On the outbreak of war, the simultaneous and prompt conversion of our naval arrangements from a peace to a war footing will be of the utmost consequence to our commerce in every ocean district of the world. The commerce of foreign Powers is so small compared to our own, that we have practically "to police" international trade in peace, at a sacrifice of naval efficiency for war. Hence it is that in distant seas foreign squadrons are more ready and are better adapted to purposes of sea attack than are ours for sea defence. It is just as much in the interests of the trade of our Colonies and Dependencies as it is the mother country's, that this necessary police work should be done. It is equally their interest that every precaution should be taken to ensure that what adds to commercial prosperity in peace shall not be a fruitful cause of the absence of adequate protection for our common sea trade in war. Here, again, co-operation is needed to secure that end, and at Colonial ports in the Pacific should ocean cruisers be held ready in reserve for war service in those seas.

As to reserves of seamen, it is on the United Kingdom and the Atlantic provinces of Canada the Empire must, for many a day to come, chiefly rely. But it is to be remembered that science is increasing the demand for seagoing, seakeeping fighting ships, while reducing the number of men required to fight them.

Such, then, would be the chief requisitions of a naval and military character made by the Empire's growth. The underlying principle common to all is a recognition of the practical difficulty of providing protection for our Empire's interests in the other hemisphere by the single-handed efforts of the population and resources of our Island in this. The difficulties are increasing, and the need for honestly facing them is very great. They can only be met by combining the resources under our flag by a comprehensive system "for the maintenance of common interests and the organized defence of common rights."¹ No such system on a settled basis is possible without co-

¹ *Vide* 4th Article of Declaration by the Imperial Federation League. Central

operation between the mother country and the Colonies. Without a defined and arranged basis of joint action, no settled system can exist and no plan for effectual defence can be carried out. The mother country and the Colonies have really now to choose between some form of Federation for mutual defence, or reaping with the Dependencies a harvest of difficulties and dangers, if not great disasters, in war.

What Imperial Federation, naval and military, really means is not "spread-eagleism;" not a declaration of "defiance" to the world; but business-like arrangements between the Colonies and the mother country for the discharge of the responsibilities and the duties of "defence." It is a duty we all owe not only to ourselves but to the two hundred millions of people in the Dependencies, for whose present interests and future safety we are each and all concerned.

To some, I fear, it will be disappointing that more has not been said in respect of Home and Colonial military forces being amalgamated for service in the field. Looking, however (Diagram IV), at the present distribution of population, and to the rates of wages at home and in the Colonies, I find myself driven to the following conclusions:—

That for some time to come no such portion of the populations as could add appreciable numerical strength to a British army in the field can be withdrawn from the Colonies for service in a prolonged campaign. The cost to the Colonies, owing to the necessarily high scale of soldier's pay, would be out of all proportion to the force produced in the field. Practical difficulties might arise from the fact that men sent from the Colonies received more pay than the men sent from home, though doing precisely the same duty. It is by no means certain that when a British army has to take the field, Colonial forces may not have plenty of work to do to defend interests near their homes, or to seize and hold naval bases established by an enemy in the Pacific or Indian Seas.

The amalgamation of Home and Colonial forces for *field* service does not urgently call for co-operation between Home and Colonial Governments. Preparation for the coming time when present relative economic conditions have somewhat changed can be by other means sufficiently met. Such means may be described in a few words. By offering every possible facility, by breaking down every bar or hindrance or custom which tends to prevent or obstruct our fellow-subjects in the Colonies from having the same opportunities and advantages of entering and advancing in the public services of the Crown, be they naval, military, or civil, which we at home enjoy. Further by a readiness to facilitate in every possible way the training of field forces in our Colonies, and at all times when offered assistance in the field by Colonial Governments to accept such proposals with prompt gratitude where and whenever possible.

Such are the germs which, if planted now, will produce the ripe fruit, in the form of Colonial field forces, in due time. That time will be hastened as population is attracted from Great Britain to the

office, 43, St. Margaret's Offices, Victoria Street, London, S.W. This League has branches throughout the Empire.

Colonies, and their great areas of fertile lands now lying waste are peopled and cultivated by our own kith and kin.

Numerical strength for the British Army for field service must be drawn from the United Kingdom and the Dependencies, not sought for in the Colonies. Officers and non-commissioned officers of Colonial forces should, however, be employed where possible with the army whenever and wherever it takes the field.

Conclusion.

It has not been possible to do more than indicate some broad principles, and illustrate them by reference to general naval and military requirements of large areas. They cover, however, a variety of special considerations which merit the greatest attention. I can now only briefly refer to one.

Since 1851 the stream of interchange between this side of the world and the other has been turned into a new channel. The Suez Canal has complicated our maritime position, and while giving us certain military advantages—so long as we can hold our own at sea—it has added to military responsibility in supporting the operations of our fleet. I would point out that such weight as may attach to my observations on ordnance and garrisons, and war vessels for the Pacific and Indian Seas, is not in the least diminished by the assumption that the Suez Canal will always be open to us in war. If, however, the probability or the possibility of the Canal being closed to us be admitted, the facts come home to the mind with accumulated force. The possibility of such an occurrence it is not reasonable wholly to ignore. The consequences to maritime security in the other hemisphere will depend upon how far we have developed to an adequate extent the resources the Empire possesses in the Pacific. The results to our position in India will be wholly determined by the precautions we have taken to provide for the most rapid and ready transit of troops by alternative routes.

The Empire's answer to a "blocked" Suez Canal has been given by Canada. The influence which the "Canadian Pacific" can exercise on our naval and military position in the far East is immense. On this point I have said so much during past years that it is only now necessary to add a few words.

Now that the railway *has* been built, the facilities it offers as a means of reinforcing India sooner and more certainly than by the Cape are generally understood. Successive Ministers holding the seals of the Colonial Office have publicly testified within the last few months to the opportunities and advantages to the whole Empire this alternative route presents. Under our existing arrangements, however, it appears that our naval and military policy to provide for our common safety must be influenced by, if not subordinated to, the department of the Post Office. There never was a stronger proof that some sort of Federation for defence is necessary to enable naval and military authority to develop in peace a settled plan for the defence of our Empire in war. When that war comes we surely

shall think more of the speed and certainty with which we can throw troops into India than of the past profits made on our own letters by the office in St. Martin's-le-Grand.

As regards the sea extension of the Canadian Pacific by subsidizing a powerful line of steamers to join Port Moody with India, *viâ* Hong Kong, and with Australasia, *viâ* Fiji—the facts as to the saving of time in communication with Hong Kong, India, and Australasia, *viâ* Vancouver, are before the public, and need no comment here. The advantages that route offers as a military road do require some special remarks.

In the first place, whether the Suez Canal be open or closed to us in war, troops *en route* to the East must pass along and close to the Atlantic sea-face of Europe. If the canal is open, the line of route will continue along the major axis of what is practically a European lake. Just in proportion to the nearness of our sea-lines to hostile or to neutral ports, so are its dangers. The more numerous the nationalities possessing commercial or war ports, the greater, under the provisions of international law, are the facilities afforded to our enemies' cruizers for coaling and supplies. Their original power of continuous attack on our sea-lines is greatest where the war or commercial resources of seaboard are most developed, and the nationality of such ports is most varied. The North-east Atlantic district presents to us the maximum of these dangers.

For these and for other reasons a military transport steaming from Liverpool or Galway to Halifax, north of Ireland, would not be exposed to the same risks in war as crossing the Bay to Gibraltar or passing from Gibraltar to Port Said. The remarks made as to the transport of munitions of war during hostilities applies with tenfold force in the case of troops. So far, then, the route from here to the Atlantic terminus of the Canadian Pacific line offers, as regards security, superior advantages to all others during any war with a European Power. There are more fast ocean merchant steamers employed in the lines between the mother country and North America than on any other. It is from that quarter of the globe we must wholly rely for wheat in the event of a blocked Suez Canal or other circumstances cutting off our Indian supply. The safety of our food supply in war will largely depend upon the speed of the vessels available to carry it. The safety of troopers will be more or less due to the same cause. The adoption of the Canadian Pacific route would not, therefore, dislocate our food supply arrangements. The fast ocean steamer which landed troops at Halifax or Quebec could take a return freight of wheat there, or in the neighbourhood. On the other hand, trusting to the Cape route alone as the *one alternative* military road to India, must deprive the North-west Atlantic service of a very large proportion of its best and fastest steamers at the supreme moment when for national reasons they will be most required there.

Turning now to the North Pacific—if the Sandwich Islands coal-stores are watched—the period of a fast steamer's danger, running from Vancouver to Hong Kong, or to Fiji, is limited to the few hundred miles measured from the terminal point at both ends of the

lines. There are practically no bases which would enable steamers without great staying powers keeping the sea anywhere over more than about half of the line. The expanse of water is so vast that by a slight but constant variation of the course of our steamers, we could reduce the likelihood of a hostile vessel of equal speed and staying power falling in with our steamers to the merest chance.

Besides purely military considerations in respect of India, and others specially relating to communication in war with Australia, there is another standpoint from which the question of establishing new lines of powerful steamers from Vancouver's to Hong Kong and Australasia should be regarded. In the first place the establishment of such a line would naturally and at private expense develop means of naval repair and refit in the waters of British Columbia. These would be available to Her Majesty's ships in war. In the next place it is material we should place ourselves in a position to promptly reinforce naval forces on the American side of the North Pacific, as well as in China and Australasian waters. If war cruisers are held in reserve at Vancouver's, as well as at Hong Kong and an Australasian port, this can be done provided we have the necessary high speed steamers to "mobilize" the naval personnel on the spot. It cannot be done if we have not localized lines of such steamers connecting Vancouver with Hong Kong, and Australasia. They would enable us to distribute Officers and seamen to war cruisers at such places, and to supplement them with Naval Reserves, drawn from the mother country or Eastern Canada in a few days.

If these conditions be fairly considered side by side with the advantages the Canadian Pacific route offers as to time, the gravity of the Imperial question referred to a departmental Committee will be more fully understood.

From the time of Sir Francis Drake to that of Sir John Franklin, England spent millions of money and sacrificed freely some of her noblest sons in the vain hope of discovering for her own advantage a natural north-west passage.

Steam and engineering science, the foresight of Canadian statesmen, and the resources of the Canadian people, have given to England and the Empire all the advantages for common defence which nature denied.

Drake, three centuries ago, failing to find it, sailed from the neighbourhood of British Columbia, eastward, on the famous voyage round the world. It is quaintly told by the historian that before departing from the American continent he set up a plate nailed to a "great faire post," whereon he engraved the name of Queen Elizabeth, as a monument of "our being there," as also of Her Majesty's "right and title to the same." In our own time the descendants of the men who with Drake encompassed the world, and defeated and destroyed the "Great Armada," were able to telegraph from these same regions to another Queen of England that they had set up a great iron way which joined two oceans, "as a monument of their being there," as also "Her Majesty's right and title to the same."

After all the lives and treasure we have thrown away in trying to

find a road to the Pacific through Arctic ice, are the advantages which Canada offers for our common defence to be weighed against some departmental difficulty concerning a two-penny halfpenny stamp? No stronger argument than this is it possible to produce in favour of Imperial Federation for Defence:—the want of some executive and administrative machinery which would raise an Empire's safety above the level of political and local party strife, and make continuity of naval and military arrangements for the defence of the Empire possible, and secure the development of a settled plan.

Lastly, I produce Table IX, comparing aggregates of our Colonial Empire with the United States. The lessons it teaches are plain and simple. Though the people of the United States love peace as much as the Colonies and we ourselves, they maintain a regular naval and military force as a ready nucleus in case of war. With a revenue only double the aggregate revenues of our self-governing Colonies, the United States spend thirteen times as much on preparation for war as our whole Colonial Empire. The sea trade of the whole United States in annual value is only some 75 per cent. in excess of the aggregate trade of British self-governed Colonies alone. Only a small proportion of the trade of the States is carried in American bottoms, most of their ocean-carrying business and practically all that of British Colonies is carried by British ships. When we are at war every British ship will be an object for attack. The States, however, with such small mercantile marine interests, spend over 3,000,000*l.* a year on naval precautions. On a seagoing force the British Colonies spend nothing at all! If the cost of naval volunteers here and there in the Colonies can be considered as "naval expenditure," in that case the last remark must be corrected by stating that the United States spend seventy-five times as much on preparations for maritime war as all our Colonies put together!

These are facts very germane indeed to the question of Imperial Federation for Defence, but upon them I can here offer no further remarks.

The Colonies showed the old spirit, when across the waves our fathers ruled, came offers of help and Colonial Volunteers to the Soudan. The native Princes of India then, and not for the first time, gave proof that, though not of the same race, they were swayed by the same sentiments. The movement of Indian Forces to the Mediterranean and the Nile illustrates, however, not merely the force of sentiment, but the value and possible extension of outlying organized power. If science has increased and is increasing difficulties to Old England and her offspring, it also offers to her and to her children as a united Empire, the means of escape from them, if we will.

We have ceased to wonder that cricket matches are arranged by telegraph between Australia and England, or rifle matches fixed between the marksmen of Canada and marksmen at home. It comes in the natural course of daily events that very soon after Canadians score "bulls'-eyes" at Wimbledon, the Australians bowl us out at Lord's. Are the gifts of science to be only applied for purposes of

the cricket field and rifle range? Are they to remain neglected and unused for want of such an Imperial system as can combine British power for British protection in war?

I commenced this paper by illustrating growth of commerce and of population, growth of shipping and of revenue. I cannot close without drawing attention to another sort of growth—the growth of war.

At the opening ceremony of the Great International Exhibition, 1851, a thanksgiving was offered up “that nations do not lift up the sword against each other, nor learn war any more.” This expressed the hope of the civilized world in those days. Now, in the thirty-five years which have since elapsed, there has been twice as much bloodshed, and more than double the money spent in war by civilized Powers than during the sixty-five years which preceded the offering up of that thanksgiving. Such is the teaching of a century. Such the vanity of human hopes.

However, therefore, we may earnestly desire peace, however much we may lament the growth of war, it is time the citizens of our “great world State” should band themselves together by Imperial Federation for Defence, if they are determined to preserve, not merely by sentiment but by sacrifice and system—that which our fathers won for us—an Empire and the freedom of the sea.

H.R.H. the DUKE OF CAMBRIDGE: Your Royal Highness, my lords, ladies, and gentlemen, it now becomes my duty, as having occupied the chair on this occasion, in the name of this large assembly to thank the gallant Officer for the very interesting and valuable lecture that he has given us this afternoon. There is only one point in which I venture a little to differ in the way he has put this question. He has put his scheme before you as a case for war—but I should rather put it as a case for peace. What he has demanded is in the interests of peace; what he asks for is really an assurance against war. I am one of those who contend that if countries such as we have heard represented to-day are prepared to meet emergencies, war is the last thing that will probably take place. On that ground I consider that instead of being a warlike, this has been an extremely peaceful lecture—a lecture which ought to open the eyes of this country and make us feel that we have an enormous Empire to defend—an Empire which I do not suppose anyone—certainly no one present—would wish to see diminished one single iota. The fact of our having a great Colonial Exhibition here this year seems to me to render what we have heard just now extremely appropriate. It so happens that there are a great many of our friends from the Colonies who are assembled in this great metropolis at this present time, and I am persuaded that they are quite as English and as old-fashioned in their feeling as any one of us. The question of federation is of course an enormous one, and it is one of the most difficult questions of the day. It is a question that perhaps will never be settled in my lifetime, but we are all tending towards it, and I do not believe there is anything more likely to bring it about than this mutual feeling of necessity of mutual defence which has been so ably advocated on the present occasion. The first point in all these questions is security. Believe me, gentlemen, if you live in security you can do anything you like—whether it is commerce or trade or manufacture, all these large and enormous questions are only to be conducted when you feel secure. Security lies at the bottom of the whole of these subjects, and if, therefore, we can provide a great security not only for our home arrangements but for our great Indian and Colonial Empire, I feel persuaded that that will do more towards federation than any other consideration that can be brought forward. Then comes the difficulty in all these matters, namely, the matter of means. We can find the men, we can build the ships, but

we must have the means to do so, and unless we have the means to do so it is impossible to make any arrangements whatever. Now there arises the great difficulty. Taxation is a very inconvenient subject to talk about. Whether you talk of it at home or whether you talk of it in the Colonies, everybody of course is anxious to point out that all these things may be deferred in order to make it less uncomfortable for the pockets of the taxpayers at the present moment. That really is the question—there is more in that than in anything else. If you are prepared to do anything in regard to the subject which has now been so ably brought before us it must cost money, and without money it cannot be done. Therefore if you, or if the country—for I do not doubt that everybody here is quite prepared to do it—if the country, and not only our home country, but if the Colonies and other portions of the Empire are not prepared to go to the expense of these preparations, it is useless to think of them at all. The only way to encourage this is to make every man feel that it is his interest to insure his property, whatever it may be; and it is really, after all, a great question of insurance. I was not aware exactly what line of argument the lecturer was about to use, and therefore you will hardly expect me to go into any details. I will also further remark, that I understand there is to be another lecture on this subject later on, and therefore I would suggest that there should not be any discussion to-day. I hope, therefore, I shall have expressed your views when I have thanked our gallant friend Captain Colomb for the very able manner in which he has brought this subject forward, and perhaps the few remarks that I have made will make you all think of the really important points which he has brought to our notice.

Monday, July 12, 1886.

SIR HENRY BARKLY, G.C.M.G., K.C.B., &c., &c., in the Chair.

DISCUSSION ON THE PAPER BY CAPTAIN J. C. R. COLOMB ON "IMPERIAL FEDERATION—NAVAL AND MILITARY," WITH A SHORT INTRODUCTORY PAPER BY SIR THOMAS BRASSEY, K.C.B., ON "NAVAL ORGANIZATION FOR COLONIAL DEFENCE."

SIR THOMAS BRASSEY: "In a paper which is not to occupy more than ten minutes, it will be necessary to keep closely to the subject before us. Until within a recent period, the naval defence of the Colonies rested exclusively on the mother country. As the larger Colonies have grown in wealth, resources, and population, they have in a worthy spirit of independence gradually assumed increased responsibilities. The Australian Colonies have undertaken the defence of their harbours, both by works on shore and by a flotilla afloat. In the construction of fortifications, the advice of Sir William Jervois and other able Officers has been followed, and no further intervention on the part of the mother country seems to be necessary in connection with other works. In the defence of their coasts and harbours by naval means the Colonies cannot as yet rely on their own unaided resources. In common with the British Admiralty they have looked to the private trade of the mother country for the construction and armament of their vessels. To build ships is a simple question of money. To man them efficiently is a far more difficult task. It is impossible to improvise the personnel of a navy; and in order to give to the Colonies the full advantage of our own naval organization, further steps should be taken for the unification and consolidation of the Imperial and Colonial naval forces. With a view to this object it has been proposed that the privilege of flying the white ensign should be conceded to the public vessels of the Colonies. There has

been some hesitation in coming to a decision on this point ; the Admiralty have no voice in the selection of Officers for the command of Colonial vessels, and they may have hesitated to incur the responsibility of allowing their flag to be hoisted on ships not under their own control. I venture to think that the difficulty would be met by entering for the Navy cadets who should be nominated by the Colonial Governments in sufficient numbers to supply the Officers required for the Colonial Naval Service. The Colonial cadets should receive their education in a school on shore, which may be established at Sydney ; the curriculum should be identical with that which is from time to time approved for the "Britannia." From this school at Sydney the cadets should pass into the naval service afloat, and should be appointed to ships on the Australian station. For their examination as Sub-Lieutenant they would proceed to Greenwich, and from the Naval University they would pass into the regular line of service. When their training ashore and afloat was completed, they would be available for the navies of the Colonies to which they belong. With a plan such as I have endeavoured very hastily to sketch out, much would I believe be done towards the consolidation of the Imperial and Colonial Navies.

"Having dealt with the organization of local naval forces for coast and harbour defence in the Colonies, we may now turn to the protection of our ocean highways. That duty must remain in the hands of the Imperial Navy, and a large reinforcement of swift and powerful cruisers should be added to the fleet. We have already a considerable number of ships built and building ; we need many more. It is not possible to place an arbitrary limit on the number of ships which we require, but it is obvious that the security of our trade will be greater in proportion as we are prepared with the means of defence. The mother country must bear her full share of the burden of defending her external trade, but the wealthy Colonies would not refuse to take their part. As a condition of granting a contribution in aid of Imperial naval expenditure, it might be stipulated by any Colonial Government, which was prepared to make such a contribution, that a certain amount of naval force should be at all times maintained in the Colonial waters, or on the routes followed by the trade of the contributing Colony. The defence of the ocean trade can be accomplished, not only more efficiently, but far more cheaply, by an Imperial Navy than by the divided efforts of the Colonies. As a preliminary and practical step, the Governments of the Australian Colonies should be invited to send representatives to a conference, at which they should be assisted by the most competent naval advice. The contingency of war should be carefully reviewed ; the naval strength to be provided should be determined ; the cost should be estimated and apportioned as between the mother country and the Colonies. By this means a basis would be laid for a plan of mutual defence for the Empire, and a first step would be made in the direction of Imperial Federation."

The CHAIRMAN (SIR HENRY BARKLY) : I will ask you to join me in a cordial vote of thanks to Sir Thomas Brassey for the short but very suggestive paper which he has just read on Naval Organization for Colonial Defence. It forms a fit supplement to the more elaborate essay read before this Institution some six weeks ago by my friend Captain Colomb, and I am glad to learn that it is intended on this occasion to take a discussion on both these papers simultaneously. In the presence of distinguished naval and military Officers, it is not for me to attempt to examine the views which are put forth in either of these papers. It is sufficient satisfaction to me to know that the subject of the defence of the Empire, which I have long regarded of such vital importance, is beginning to attract the attention which it so much deserves. I will not detain you by any lengthened observations from listening to the discussion which I believe will take place, but I cannot refrain before I sit down from congratulating Captain Colomb, and with him all friends of the unity of the Empire, upon his success in obtaining a seat in Parliament. I have not the slightest doubt that he will give effective aid to those who have already in that assembly been urging upon Her Majesty's Government the necessity of prompt attention to the defence of the Empire. I will now ask you to join with me in a vote of thanks to Sir Thomas Brassey.

Admiral Sir E. FANSHAWE: Sir Thomas Brassey in his paper mentioned more

particularly the Australian Colonies, and the plan for establishing a training school at Sydney. No doubt his idea was that the same sort of thing should be carried out in Canada, although he did not specifically refer to it in his paper.

SIR THOMAS BRASSEY: I mentioned the Australian Colonies because they had begun to provide themselves with ships, and Canada has not done very much in that way yet.

Captain E. PALLISER: I returned, Sir, ten days ago from Canada, where I had opportunities of speaking to the Minister of Militia about Imperial defence, especially in connection with the personnel of the Navy. They have 40,000 sailors, and very fine men, too, scattered about Nova Scotia, New Brunswick, and Prince Edward's Island. The idea was to bring those men into some sort of connection with our Navy. I concluded that the best way to do that was to form a naval school for gunnery. I drew up the plans and estimates of the scheme, which is in print now at the Admiralty. The able and energetic Minister, Sir Adolphe Caron, has already established three schools for artillery, one for cavalry, and three for infantry. The cost of a school for naval gunnery to train about 1,500 men annually would be the same as that of our artillery school, viz., 8,000*l.* a year. The Militia Department is not prepared to enter into that expense at present, but in course of time I believe they will be quite willing to undertake it. At present they would be very glad to see the Imperial Government co-operate, and establish a gunnery school for the sailors of the maritime provinces. Supposing 1,500 were trained in that way every year, they would be liable by the Canadian Militia Act to serve on the waters of the Pacific as well as on the Atlantic, and they could be transported from one to the other by the Canadian Pacific Railway in five days: in fact Esquimalt, which is now going to be made an arsenal, will be within easy reach of Plymouth. You cross the Atlantic in eight days, you cross the land in another five days, and then you arrive at what will soon be a powerful arsenal, dominating the Pacific, and commanding rear of the Hebrides Islands, or any other islands which may be annexed round the eastern coast of Australia. The Australians are very anxious about this, there being at present no protection. The Canadian Government, by fortifying Esquimalt, are exercising an influence on the Pacific hitherto unknown, and offering considerable protection to Australia.

SIR GEORGE BOWEN: Sir Henry Barkly and gentlemen, when I received yesterday a kind invitation from His Royal Highness the Duke of Cambridge and the Council of this Institution to come here to-day, I never dreamt for a moment that I was coming in any other capacity but as a listener, for I would not venture to express any opinion on naval and military matters in the presence of so distinguished a naval and military audience. However, I may say as a Governor of twenty-seven years' experience, principally in the Australian Colonies, that I entirely agree with the view Sir Thomas Brassey expressed in his short but very suggestive and important paper. I think it is high time that something should be done, and I am quite sure that the practical step to be taken is something like that which he suggested, namely, that the Colonies should be left with the responsibility of defending their harbours, but that they should contribute to the expense of the Imperial Navy for everything beyond the statutable limit of three miles from low water mark. That of course ought to be done by the Imperial Navy, it can be done efficiently by the Imperial Navy alone; it can be done, as Sir Thomas Brassey also remarked, much more cheaply by the Imperial Navy than in any other way, and I believe that the Colonies will be ready under proper conditions to give a fair contribution, according to their population and wealth. I believe the first step towards Federation must be to confederate our fleet, so to speak. I believe that is the first line of defence, and that must be the first thing done, and I believe the Colonies even now, without any kind of Federal Council, will be willing to contribute towards the expenses of a Navy for the general defence of the Empire. But I think that that cannot last for ever. I believe in the next thirty or forty years the Crown will have as many white subjects in the Colonies as there will be in the United Kingdom. When that time comes it is simply incredible to believe that our fellow-subjects in Australia and Canada will consent to pay their fair share to the expenses of the Imperial Army and Navy, unless they have some kind of voice in some kind of Imperial or Federal Council. I believe that we must have. English-

men living in the Colonies are just as much Englishmen as those living here; it is only a distinction of locality, not of race, or thought, or sentiment. I believe, in fact, we have already a moral federation in our common language and literature, in our common loyalty to the throne, in our glorious national hopes for the future, and our glorious national memories of the past. But I think when the Queen opened, two months ago, what may be fairly called the Imperial Exhibition at South Kensington, all patriotic Englishmen must have hoped and prayed that that Exhibition would prove to be the forerunner of some closer union with the Colonies, somewhat on the principle of the federal unity of the United States of America. Such a union would, among its many advantages to the British Empire, be a guarantee of the peace and prosperity of the whole world, because I have no doubt the great British Federation would form a friendly alliance with the great English-speaking Republic on the other side of the Atlantic. So we should see *Pax Britannica* far transcend what Pliny called the "*immensa Romanæ Pacis Majestas*." In conclusion, I repeat that I entirely concur with the remarks that fell from Sir Thomas Brassey, and I think the first step towards Federation ought to be to federate our fleet.

Sir RAWSON RAWSON: Being called upon I cannot refuse to say a word upon this subject, although I am afraid I cannot add much information. I cannot help thinking that the time has arrived at which some active steps should be taken in this matter, and it appears to me that the Colonies should receive their guidance from the Central Government. That Government has the advantage of centuries of experience, which they have not possessed; it has also a knowledge of what it can contribute towards the defence of the Colonies, and a desire to take into consideration the means of the Colonies and the needs of the Colonies. I consider, therefore, that both in our War Office and in our Admiralty one Officer should be specially appointed to consider the best means of the defence of our several Colonies. If the business of a number of Commissioners or a number of high Officers in the War Office is so great and so various that they cannot apply their minds and devote their time to the special consideration of this great subject, I conceive that it would be of the greatest advantage in each of those departments that an Officer specially qualified should be appointed, as a Moltke in Germany, to consider, not how we can take the aggressive against our neighbours, but how we can best establish the means of defending our own outlying possessions; and that the business of this Officer should be to communicate with the several Colonies, to know their wishes and their dispositions. In that way the Colonies would know that they had a particular Officer in those departments to attend to their interests, because those who have the arrangement of Government offices know how these questions which are burning and may suddenly burst into a flame are put aside for something more immediately pressing, or which interests more the political parties at the head of those Departments. I cannot offer any original observations worth listening to. I can only give you general views in accordance with those which I have heard expressed here upon the subject. I think the time has come when the proposals put forward will ripen into something that will carry out the views of those who are so anxious to bring the Colonies and the mother country together; but my own conviction is that nothing as regards our defence would contribute more to the practical purpose than the appointment of such Officers as I have suggested in the Naval and Military Departments.

Captain P. H. COLOMB, R.N.: Our attention, I think, is properly confined to the title of the paper that was read the other day, "Imperial Federation—Naval and Military." I hardly think that it is our business to consider the larger political questions which were brought before us in a subsequent lecture. It has been said by many of the public papers that the keynote of Federation is the question of defence. I think that is very truly said. If you reflect for a moment you will see that the Australian Colonies are brought into very close relations with a peculiar side of European politics, and every man in Australia must be considering this, that if the Australian Colonies had to fall back on their own means for their defence, they would be no match for those European countries with which they are brought into close contact. In Canada the same thought must be prevalent amongst the population; of themselves they could do nothing against any aggressive advance

of the great country that borders them. The Colonies must know now that they cannot take what I may call monastic views, and retire into the cloisters of commerce. Those cloisters are not closed; instead of being able to shut themselves up from the rest of the world, they find that they are being more and more brought into close relations with it, and the thought must be continually before them as to what would happen if the rest of the world becomes disturbed. Then I think that they must consider upon the whole that, though there are dangers in union with the country which is more closely mixed up than themselves with European politics, the dangers of union are less, after all is said and done, than the dangers of disunion. I think that thought must fix itself in their minds. The next point that follows is, that union in matters of defence with the mother country must be much less expensive than if they had to depend upon their own exertions. The lecturer the other day pointed out how the South American small countries were upholding a large and expensive seagoing defence, and there we have on the chart before us, Chili supplying eight sea-going modern ironclad cruisers, and Peru having suffered from the want of such things. And the Colonies must recollect that they will have to provide some defence of that sort if they come to a question of disunion with the mother country. The general thought must be that after all is said and done, a union between the mother country and the Colonies for the purpose of defence, must be a federation of peace. If this country, with the assistance of her Colonies, maintains an absolute empire of the sea, which cannot be threatened in any way, you may be quite sure the peace of the world for generations to come will be secured. It was said in some criticisms on my brother's paper, that we all at his meeting were a set of Jingoos: that we were asking people to build ironclads that would not steer, and to make guns that burst, and that the whole question was spending more money. That certainly is not my view. My view is that we were gathered together in this Institution, and are gathered together now, in the interests of peace, and that we want only such money spent as is necessary to maintain peace. Well, now, passing on to the question which is more immediately before us, that of naval and military defence, we have to recollect that there are the two things, as Sir Thomas Brassey has brought them before us, there is the question of local defence, and there is the question of general defence. Now if you think of the English Army and the English Navy, you ought to look upon them as striking instruments. They are not so much instruments of defence, that is to say, they are not restricted to portions of our own territory: for the defence of those portions, they are the chisels to be driven home into the heart of our enemies when the time comes. There is, besides, local defence, and the point before us seems to me to be, that we should be very careful not to allow any question of local defence to interfere in the slightest degree with the questions of general defence. I am sorry to find that, if I rightly understood Sir Thomas Brassey, I am in some degree opposed to his view. He seems to speak, as far as I understand him, of establishing a sort of Colonial Navy in Australia; I think that would be a very dangerous thing.

Sir THOMAS BRASSEY: Only for harbour defence.

Captain COLOMB: If it is only harbour defence, then I think our ground is clear. Harbour defence is, in my opinion, properly turned over to Volunteers and Militia, naval and military. I look upon that as the keynote of the whole question, that the striking forces that I have spoken of, the Army and the Navy, must be perfectly free, must never be trammelled with any questions of local defence. They must be free to strike wherever a blow is wanted, and we must not hamper ourselves by tying them up in any way for the question of local defence. Sir Thomas Brassey said that it was impossible to improvise the personnel of the Navy. I most thoroughly agree with him. Unfortunately for us, and I regret that Sir Thomas Brassey himself has been one of the supporters of it on one occasion, there has arisen some sort of notion that in some way we can improvise the personnel. It is hoped that when the time comes you may get sufficient scratch Officers to do the work. So far as the naval force of men in this country is concerned, we are doing very well indeed; we have the active Navy, and we have the first Reserve of highly trained men in the Coast-guard, and a further reserve of very fairly trained men—some of the finest men that England produces—in the Naval Reserves. Those men, I take it, possibly with some addition from Canada, must form the personnel.

I do not think there is any difficulty in getting the proper number of men, and it is not very expensive work to train them. When you come to the Officers, it is a much more difficult question. Unfortunately the policy of the present day has been to hope that you may deal with scratch Officers, and therefore for those extensions that are before us we find ourselves with no reserve of Officers whatever. That is the most dangerous part. Speaking of the Officers, I think your object would be, not at all to enter your cadets and to train them in the Australasian Colonies, but to promote a large influx from the Colonies into the Imperial Navy, without any distinction whatever. I totally disagree with the idea of bringing in Officers who are to be specially Colonial Officers, those, as I said before, are required for local defence, but they must be in the form of Volunteers and Militia, who are quite competent to do the work.

Admiral the Rt. Hon. Sir JOHN D. HAY: I have attended on the former occasions when this subject was under discussion, and I am sure we are very grateful to Captain Colomb for having given us the information which he has, as well as to Sir Thomas Brassey for the paper which he has just read. And I am very glad to hear from speakers to-day, both those who are acquainted with the Colonies and those acquainted with the Services, that Imperial Federation must begin with the Navy. That appears to be the view also of Mr. Froude. All of us have probably read "Oceana," and he has given us information there which shows that throughout those Colonies in which he passed some time that was the general feeling. Sir Thomas Brassey specially alluded to the Australasian Colonies, and therefore, although I know that he means the proposition to be co-extensive with other Colonies, at least with Canada, I should like to allude particularly to the Pacific and to the Australian Colonies. I should like to guard the Colonists against contributing in money alone to the Imperial defence. With a democratic House of Commons the contribution of a large amount from the Colonies would mean diminished Navy Estimates at home. I think that they in contributing should take care that they have *quid pro quo*—that they have something in hand which would ensure the expenditure of the mother country in their defence as well as in its own. Sir Thomas Brassey, and with his experience, and the weight of his authority, I am sure we must have heard it with satisfaction, has pointed out that in spite of naval scares and the exertions made by himself and others to endeavour to get the country to give us a sufficient number of ships for our defence, we have nothing like it as yet, and it is quite certain if the mother country were at war, especially at war with a European Power, the result would be that all the ships we possess would be wanted for the North Atlantic and for the Mediterranean, and that the Colonies would be left out in the cold; their commerce would be left out in the cold, and unless some preparation is made for the defence of that commerce it would suffer enormously. Just let us remember the state of things when war was anticipated four years ago. And when I speak of ironclad ships it will be understood that with an ironclad ship, as our friend Admiral Fremantle has pointed out, there must be a certain number of other ships associated, but I speak of the ironclad as a unit which gives the key to the number of vessels likely to be required. In the Pacific there were at that time four Russian, six French, and I think four Chilean ironclads,—there were some thirteen efficient ironclad ships, and I believe the most we ever mustered there was something like four or five—the flagship in the Pacific, the flagship in Australia, and some three in China. Australasia and Western Canada ought to protect the Pacific,—the commerce of the Pacific ought to be entirely protected by them. But I agree with my gallant friend Captain Colomb, and I think with Sir George Bowen, that there must be a unity of command, and that the Imperial Admiralty must have the direction of the forces. Let us assume that Canada for the Pacific contributes in kind two ironclads with the additional ships necessary for them, and that each of the great Australian Colonies, according to their degree, produce the same, two for New South Wales, two for Victoria, and perhaps one for Queensland, one for New Zealand, and another perhaps conjointly for South Australia and West Australia, or Tasmania, speaking of it without giving the absolute numbers: and say that India again contributes four ironclads for the defence of the Indian Ocean, you then have the certainty that you would have in these seas a sufficient fleet to protect them, and the Colonies would have the

mother country in hand this way that they would say, "We will contract for the manning of these ships on condition that they serve here,—if not those particular ships, equivalent ships." If the "Sydney" or "Melbourne" is moved to the Mediterranean then equivalent ships must be sent into those seas, but the training of the Officers ought to be identical. I am not persuaded by Sir Thomas Brassey's eloquence that it would be desirable to have a subsidiary colonial training for Officers. I believe in having them sufficiently educated, as they can be, in the public schools there to pass the necessary preliminary examination for entering the Navy, and having them examined to save them the trouble of being sent home until they were pronounced fit. I am glad to see the age of sixteen is to be the time at which they are to commence their examination now. Lads of sixteen having passed their examination should go home and should be trained with the same associates and should rise to the same rank and in the same manner. I do not think it at all necessary that the thirteen ships in the Pacific should be commanded by Australian or Canadian Officers. A Canadian or Australasian Admiral would give as good an account of the enemy as could be required, but let him command in the Mediterranean,—if it is necessary he could command as well there. Let him take his turn with other Officers, and let them be identical in all respects and not be earmarked as belonging to Australasia, or as belonging India, or as belonging to the Cape or anywhere else. Let them belong to the great Imperial Navy and be ready to take their share in the Imperial defences. I believe that a contribution partly in kind from Canada, Australia, and other Colonies, if they were willing to join or could afford it, and the amalgamation of the youth of Australasia and Canada and the other Colonies with Englishmen, Irishmen, and Scotchmen who are serving in the Navy, would bring about a unity of force and sentiment which would go far to complete the Imperial Federation, about which I am not going to trouble the meeting. But I thought it was worth while suggesting to the distinguished Colonists who are here that there is a democratic House of Commons, and that it is very uncertain whether a contribution in money from the Colonies would not mean a saving of the taxpayers at home. That is not what we want. What we want is an efficient fleet, a fleet with a sufficient number of ships which Sir Thomas Brassey, with all his authority, has not been able to get from this country, and which if the Colonies are in earnest they will be able to give us.

Mr. LABILLIÈRE: I am sorry that I had not the advantage of hearing Captain Colomb's paper, having been unavoidably prevented from attending on the day it was read. There is one branch of the subject upon which I should like to say a few words. We have already heard the naval aspect of the question discussed, and I should like to speak, although a civilian, upon the military aspect of the question. I am induced to do so because I was very much struck by the admirable speech I heard delivered by His Royal Highness the Commander-in-Chief at the Imperial Federation banquet the week before last, and more particularly with the remarks of the Duke of Cambridge expressing regret that Imperial troops had been altogether withdrawn from the Colonies. That has always been my feeling. As a native-born Colonist I have always thought that it was an immense advantage that the colonial-born youth should see the red-coats amongst them. One of my very earliest and most distinct recollections is that of having seen, when a small child, some red-coats marching along the streets of Melbourne: and I do not know how far the Imperial sentiment, which has grown with my growth, and strengthened with my strength, may have originated with the sight of those troops. I therefore, as a native-born Colonist, should like to see Imperial troops with the old red coat in all our Colonies, if for no other purposes than this, that Imperial sentiments should be fostered among the native youth. But beyond that, there would be a great practical advantage. We have heard to-day about the Colonies providing ships of war according to their means. Now although the Colonial forces are very efficient, and we have had a striking example of it in that regiment sent to Suakin, I think it would be a great advantage to the Colonies if they had always regiments of Imperial troops amongst them, to set before them the highest standard of Imperial drill. I believe it could be done in this way. According to the more recent military system of organization, instead of regiments being known by numbers, they

are distinguished by their territorial names. To us civilians this has caused a good deal of confusion, for we have now to remember regiments by the names of counties, the "Middlesex" regiment, the "Surrey" regiment, the "Somerset" regiment, and so on. Now one way of giving practical force to the idea thrown out by Professor Seeley, that the Colonies are the expansions of England—"so many Kents"—would be to add to our Imperial Army, Colonial regiments. Let us have, if you like it, the 1st, 2nd, 3rd, and 4th Australian or Canadian regiments, or perhaps, better still, let each one of the Colonies maintain an Imperial regiment. Let us have the "New South Wales" regiment, the "Victoria" regiment, the "Queensland" regiment, the "Ontario" regiment, and so on, the headquarters of those regiments being in the particular Colonies from which they are named. But in order to keep them thoroughly in line with other Imperial troops, I think it would be necessary that they should be from time to time brigaded with large portions of the Imperial forces, and therefore that each Imperial regiment thus territorially assigned to any Colony should spend one year out of every three or four brigaded with troops either in this country or in India. Of course there would be some expense attached to moving troops backwards and forwards, but that would not be very serious. We have plenty of transports; we must always feed the troops, wherever they are, and the only expense would be merely their conveyance backwards and forwards. What was suggested by Sir John Hay ought to be done with regard to these troops; there should be an understanding with the Colonies that they should never be left without Imperial troops. It was upon this point that the difficulty arose with regard to leaving Imperial troops in Australia. The Australian Colonies were each willing to have kept a regiment if the Imperial Government had given a promise that those regiments should not be withdrawn in time of war; and I think it would be essential to the carrying out of the scheme which I venture to propound, that such a guarantee should be given, so that when the Colonial Imperial regiment was to be taken away for the purpose of being brigaded with troops elsewhere, another regiment should be brought in its place. Then with regard to the officering, I think that precisely the view recommended by Captain Colomb, R.N., and Sir John Hay, with regard to the officering of the Navy, ought to be carried out in the officering of these Imperial regiments. I think it would be a very undesirable thing that the "New South Wales" regiment, or the "Victoria" regiment, or the "Ontario" regiment should be officered exclusively by Canadians or Australians. It should be done in this way. Each Colony having an Imperial regiment should be given a number of commissions, at least corresponding to the number of Officers in its regiment, and those commissions should be conferred upon Colonial youths, but not for the most part to be held in the Imperial regiment of the particular Colony, but be scattered throughout the Service. Thus, what is recommended by Sir John D. Hay and Captain Colomb, R.N., would be thoroughly carried out. With regard to the Navy, we should have Colonial-born Officers in many of our ships of war, and we should have many Colonial-born Officers in a great many of our regiments, and the Imperial idea of there being no distinction between people of the mother country and Colonies would be fully carried out. I shall not venture to dwell any further upon this matter. I perfectly agree that, although we ought to keep steadfastly in view the point for which we are steering—the complete organization and ultimate perfect Federation of our Empire—there are a great many practical things in that direction which we can do at once, and there is nothing more practical than the thorough organization of our military and naval defence. We shall not only be placing the whole Empire in a position of security, but we shall help ourselves on very considerably to the ultimate goal, Imperial Federation, for it will be found that, in order efficiently and thoroughly to carry out our system of defence, we must have joint representation, and joint representation means Imperial Federation.

Captain J. C. R. COLOMB, M.P.: I think after the very admirable speeches we have had there is nothing in fact left for me to reply to, as far as my paper is concerned. There are just one or two observations I should wish to make with regard to Sir Thomas Brassey's paper. If Sir Thomas Brassey means the creation of separate Colonial navies, then I am very much afraid I am entirely out of all accord with him.

Sir THOMAS BRASSEY: Only for harbour defence.

Captain J. C. R. COLOMB: I am glad to hear it, because I think we must see at once what we have to do. The Navy has originated and grown up with the assumption that the United Kingdom is the whole Empire. That is now changed, and our Empire is spread over the world. We want an Imperial Navy. What has happened is this. We call our Navy an Imperial Navy, but it is not Imperial in any sense of the word. It is the Navy of the people of the United Kingdom only. That is one of the reasons for the state of things Sir John Hay called to our notice. The people of the United Kingdom, therefore, do what they like with it. They cut it down one day, and increase it the next; in fact they are most often engaged in cutting down, but at all events the Navy Estimates are framed not according to the Imperial interests, but to meet a party division, or from fear of the front Opposition bench. Therefore the main point that occurs to me is, that so long as your defence, which is Imperial, is mixed up and controlled by a Parliament which deals also with local affairs, so long will your Imperial questions, such as defence, go to the wall. The step to be taken is to raise it above the purely local influence of the United Kingdom. I therefore agree with Sir John Hay in the broad fact that if you are going to have an Imperial Navy it must be by aid of Colonial contributions, and it must be put absolutely out of the power of the local politics in the United Kingdom alone to interfere with its required strength. With regard to what fell from Mr. Labillière, who has done so much on this question of Federation, I should wish to say we have to bear in mind that we are growing, and that the balance of British power is shifting every day, shifting over the sea, and all you can hope to do at present is to make use of the materials of naval strength as they come to hand, and graft them into one Imperial system. The fact is we have no definite Imperial policy. Take that very question of the withdrawal of troops from the Colonies. I maintain it is not only a loss to the Colonies, but it is a loss to the Army, and in this way. I take it much of the efficiency of our Officers and men would be due to the fact that they have served in different climates on expeditions through different territories, under different climatic conditions, and learnt to accommodate themselves to circumstances. When our troops were quartered in our Colonies, the Officers had opportunities of taking part in many shooting, fishing, and exploring expeditions, and thus acquired practical knowledge of roughing it; therefore when they were ordered on a campaign they knew how to direct their men, because they had had personal experience, an experience that they never could pick up in camp or on parade. It comes not by nature, but by knowledge picked up in roughing it, and it is only by bringing Officers under those circumstances of roughing it in peace that you get experience available in war. With regard to the withdrawal of troops, we had no policy at all, and I will content myself by pointing that out as a warning with reference to what we are doing now. First I take the Army. It is quite true that the Australian Colonies did offer to pay for troops, provided that they were left there during war. But they stipulated also for the number that they were prepared to pay for in peace. That number was objected to by our Government, on this ground, that as a battery of artillery was so many men, and a regiment of the line was so many men, that meeting the wishes of the Colonies with regard to the number would interfere with the organization of the Army. But, Sir, before the last troops landed from the Colonies in this country, we had altered the organization of the Army altogether, and accordingly that pretty well shows we were not acting upon any Imperial principle at all, it was merely that the House of Commons, in its blindness and ignorance at the time, thought the Colonies were inconveniences, to be parted with. With regard to the Navy we have done equally badly more recently. Sir Thomas Brassey has alluded to the work of Sir William Jervois. No one in this room has a higher opinion of Sir William Jervois personally than I have, but he was sent out to do wrong. If you read the correspondence at the time you will see that the Australian Colonies got frightened. They wrote to the Imperial Government and asked for its advice, and there is an amusing series of telegrams, the Colonies bargaining with Sir William Jervois as to what he would go for, and how much they were to pay for his assistance. Just realize what that means. Supposing Portsmouth is found to be in an insufficient state of defence, and the people of Portsmouth bargain with

the Inspector-General of Fortifications as to his charge for coming down. Well, Sir W. Jervois went, each Colony employed him, and he gave each separate Colony advice, as if they were always to remain separate and independent of one another. Now your difficulty in dealing with Australian defence is due to that very thing. We started on a false principle, or rather on no principle, and the whole thing is in a mess. I think we have to reverse all this. You know, Sir Henry Barkly, better than anybody in this room, the whole circumstances of the Imperial defence question. You were on the Royal Commission, and you know that every sort of information was given to that Commission, and no expense was spared, but the Report of that Commission seems to have gone to a dusty old pigeon-hole, and nobody knows what has become of it; the country is not much better off than if it had never sat. I think the only way to meet the present difficulty is to let the Empire know the state its defences are in, and I would remind you of the fact—because it is a very important one—Lord Palmerston, who was in earnest about the defence of the United Kingdom, when he formed a Commission for the purposes of that defence, published every bit of evidence and every item of information it collected, showing exactly all our weakness, he published it for the whole world to see, and the result was he got the money. With regard to the general matter, I most cordially agree with Sir Thomas Brassey on the first step, and I believe the only step now to be taken, and one I have urged very often, that is to call a British Conference with Colonial representatives to examine the whole question, and I am quite sure that practical statesmen in the Colonies meeting with practical statesmen at home will be able to produce the basis of a practical arrangement, and to lay down the principles of a system under which the Empire may grow with safety, increasing its defence with the number of its growth, and in a manner suited to the wants of our Empire.

Admiral Sir ERASMUS OMMANNEY: I wish to express my very great satisfaction at the suggestion which has been made to establish a Naval College in the Colonies. What you want is to have a means by which education may be readily obtained upon maritime subjects in our distant Colonies. I therefore entirely support the suggestion which has been made. At the same time I am very much struck by the observation that we can go too far by withdrawing our Imperial forces from those Colonies. When I stood on the rock of Quebec some short time ago and asked what troops there were there, I was told there were none whatever. I believe that the Imperial force was got rid of in order to satisfy certain prejudices, but everybody agreed that an English regiment at Quebec was a sort of nucleus and would contribute very much to the formation and building up of our troops in Canada. That rock is the Gibraltar of Canada, and it is now somewhat in a defenceless condition for want of a sufficient corps of Royal Artillery and Engineers to look after the batteries and defences now going to ruin.

Sir THOMAS BRASSEY: I was very brief in the paper which I had the privilege of reading, and I know I ought to be exceedingly brief in reply, but I must say a word or two in explanation upon the points which gentlemen have referred to. My intention was to limit the action of the Colonial naval forces strictly to harbour defence, to that particular sphere of responsibility which has already been accepted by the Australian Governments, and for which they have made a certain provision in the form of floating batteries and gun-vessels; but although I contemplated that the work of the Colonial navies should be limited in the future, as now, to the sphere of harbour defence, and although it may be quite true that to man vessels intended strictly for harbour defence, a sea militia or some force of that kind suffices, yet I apprehend that for the command of sufficiently powerful vessels for the purpose of harbour defence and for the organization and training of any considerable force of sea militia or Naval Artillery Volunteers, you require a certain body of Officers with a considerable amount of training, and I endeavoured to convey the idea in the paper that the best mode of training Officers who should be placed in charge of the defence of the Australian harbours by naval means was to give them the opportunity of serving a certain number of years in the Royal Navy. If at any time we were in danger on our own coasts, or had to provide for our coast and harbour defence, I do not know to whom we should look with such confidence as to Officers trained in our own Navy, and I think the same view is applicable to

the case of the Colonies. Gentlemen have been rather critical of the suggestion that there should be a new "Britannia" established in the Colonies. It seems to me that for the purpose of educating Officers to be put in charge of the naval defence of the harbours of the Colonies a special training is extremely desirable, and I take it that the Colonial Governments will always desire that the commands of vessels which they maintain solely at their own expense for harbour defence shall be vested in themselves. Hence I conceive that it will be satisfactory to those Colonies to have some system of training for the Officers to be employed in their harbour defence. I think that a school of the character of the "Britannia" established in the Colonies would not only enter cadets for the Colonial Harbour Defence Service, but would also be a means of bringing into the Imperial Navy an increased number of youths who would be entered to go forward in the general line of service. Now I think that it would be a means of bringing about that great object which we all have in view, Imperial Federation, if we could introduce into the Navy and the Army a certain number of Officers drawn from the Colonies. I can quite imagine that there would be many cases in which parents would hesitate to part with a son of tender years, and send him for two or three years to be trained in the "Britannia," but who would willingly send a boy to a school of a similar character established nearer home. Such a school would cost nothing to the mother country. With reference to a point on which we all stand agreed, namely, this, that the defence of the highways of our own Imperial commerce must devolve upon one united Imperial force, we all recognize that sooner or later, in order that that defence shall be complete and adequate, it will be fair and proper to call upon the Australian Governments and the other wealthy Colonies to make some proportionate contribution, and I quite agree that if they are asked to make such a contribution, they are entitled when making that contribution also to make a bargain with the mother country, with regard to the amount of force to be provided. Unless there was to be an additional force provided, I would say that there should be no contribution. There is a precedent for such a bargain in the arrangement with the Indian Government, which now pays 75,000*l.* a year to the Admiralty on condition that vessels be permanently maintained in the Persian Gulf. Upon that principle these contributions might be made from the Colonies. Sir John Hay alluded to the insufficiency of the Navy. I must acknowledge to him that in one very important class of vessels I am more impressed with our necessities than formerly. I must acknowledge that I am less sanguine of the practicability of furnishing ourselves with swift cruisers for the defence of our commerce from the mercantile marine. When this question came to be practically studied on the occasion of a recent emergency, we were impressed more seriously than before with the defenceless character of the vessels which are built for the mercantile marine. They are excellent for what they are built to do, they are splendid ocean steamers, they maintain their speed in a marvellous manner in all descriptions of weather, they are great cargo and coal carriers; but when you look at them with reference to their means of resisting the effects of shot, I am bound to say that there is much that is wanting. And therefore I think it becomes more urgent to build extensively swift cruisers for the defence of our commerce. That brings us back to our point of departure, namely, to the desirability of arriving at some means by which our resources can be supplemented by contributions from the Colonies. It is a great subject, and all I can say is we never seem to have stood so well at any former time for the consideration of all these subjects in a thoroughly harmonious, patriotic, Imperial, and united spirit as we do to-day. The great service rendered by His Royal Highness the Prince of Wales in bringing about the present Exhibition cannot be spoken of in too high terms. I need not detain this meeting longer, but before I sit down I shall be glad to have the privilege of proposing a vote of thanks to Sir Henry Barkly for kindly coming and presiding to-day.

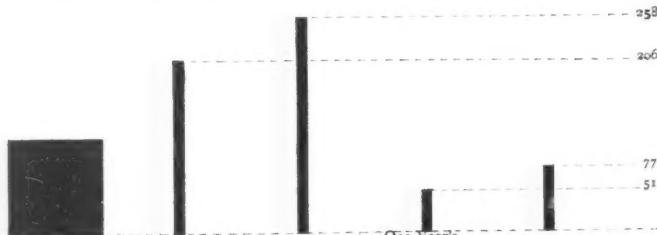
The CHAIRMAN: I am much obliged to you for the compliment you have paid me; I have done little to deserve it, but it has been a great pleasure to me to be present.

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TABLE No. 1.

DEPENDENCIES 1884-5.

Area. Population. Trade. Shipping. Revenue. Millions.



	Area.	Population.	Trade.	One Year's	
				Shipping Entered & Cleared.	Revenue.
	Square Miles.		£	Tons.	£
INDIA	1,058,814*	200,465,853*	157,255,081	7,250,603	71,727,421
CEYLON & STRAITS	26,837	3,187,368	43,918,617	9,854,284	1,792,643
WEST INDIES ...	128,374	1,506,730	18,908,344	6,558,323	2,054,675
WEST AFRICA ...	20,390	558,036	3,449,236	1,417,234	285,057
SMALL STATIONS	101,574	983,148	34,304,044	26,293,283	1,479,382
TOTAL	1,335,989 Square Miles.	206,701,135	257,895,322 £	51,373,727 Tons.	77,339,178 £

* Upper Burmah included but not the Native States.

COLONIES

Area. Population.

	Area.	Population.
	Square Miles.	
BRITISH N. AMERICA }	3,510,592	4,594,317
AUSTRALASIA }	3,161,842	3,231,717
BRITISH S. AFRICA }	433,740	1,802,417
TOTAL	7,106,174 Square Miles.	9,538,511

* Population B

COLONIES 1851.

Millions.

	Population.	Trade.	One Year's	
			Shipping Entered & Cleared.	Revenue.
B. N. AMERICA	2,471,227	12,719,232	3,234,822	1,194,235
AUSTRALASIA	534,793	8,957,610	1,085,398	1,247,909
SOUTH AFRICA	405,906	2,472,400	428,088	264,532
TOTAL COLONIES	3,411,926	24,149,242 £	4,748,308 Tons.	2,806,676 £

A.—As nothing less than 6,250,000 can be shown on this scale, Population, Shipping, and Revenue cannot be shown in Diagram.

DEPENDENCIES

	Population.	
INDIA	171,859,055	3
CEYLON & STRAITS	1,778,093	
WEST INDIES	936,717	
WEST AFRICA	200,669	
SMALL STATIONS	359,823	
TOTAL DEPENDENCIES	175,134,357	5

COLONIES 1884-5.

TABLE No. 2.

Population. Trade. Shipping. Revenue. Millions.

Population.	Trade.	Shipping.	Revenue.	Millions.
4,504,319	£ 45,749,966	9,211,025 Tons.	£ 7,080,115	176
3,231,783	118,573,876	15,381,853	22,297,790	37
1,802,495*	12,118,920	1,988,434	8,144,528	26
9,538,597	176,442,762	26,581,312 Tons.	37,522,433	9

* Population Bechuana Land not included.

UNITED KINGDOM 1884-5.

Area. Population. Trade. Shipping.

Area.	Population.	Trade.	Shipping.
120,757 Square Miles.	36,325,115	£ 644,769,249	64,272,522 Tons.

DEPENDENCIES 1851.

TABLE No. 5.

Millions.

Population.	Trade.	Shipping.	Revenue.	Millions.
859,055	34,076,037	1,561,347	27,625,360	175
778,093	3,804,327	504,341	429,701	50
936,717	9,069,646	1,075,190	730,469	29
200,669	781,190	155,338	47,837	6
359,823	3,082,047	2,733,653	537,950	
134,357	50,813,247	6,029,869 Tons.	29,371,317	

UNITED KINGDOM 1851.

Population.	Trade.	Shipping.	Revenue.
27,595,388	£ 324,803,307	14,505,064 Tons.	57,964,464

OM 1884-5.

TABLE No. 3.

ade. Shipping. Revenue. Millions.
644



ade.	One Year's	
	Shipping Entered & Cleared.	Revenue.
9,249	64,272,522 Tons.	92,640,000 £

1851.

Millions.
324






Year's	One Year's	
	Shipping Entered & Cleared.	Revenue.
505,064 00s.	57,964,464 £	

EMPIRE 1884-5.

TABLE M

Trade.

Colonies thus 
Dependencies 
United Kingdom 

Area.

Population.

Shipping.

Rev.

Colonies

Dependencies

United Kingdom

	Area.	Population.	Trade.	One Year's Shipping Entered & Cleared.	Rev.
COLONIES	Square Miles. 7,106,174	9,538,597	£ 176,442,762	Tons. 26,581,312	37,5
DEPENDENCIES	1,335,989	206,701,135	257,895,322	51,373,727	77,3
TOTAL BEYOND SEA	8,442,163	216,239,732	434,338,084	77,955,039	114,8
UNITED KINGDOM }	120,757	36,325,115	644,769,249	64,272,522	92,6
EMPIRE	8,562,920 Square Miles.	252,564,847	1,079,107,333 £	142,227,561 Tons.	207,5

TABLE No. 4.

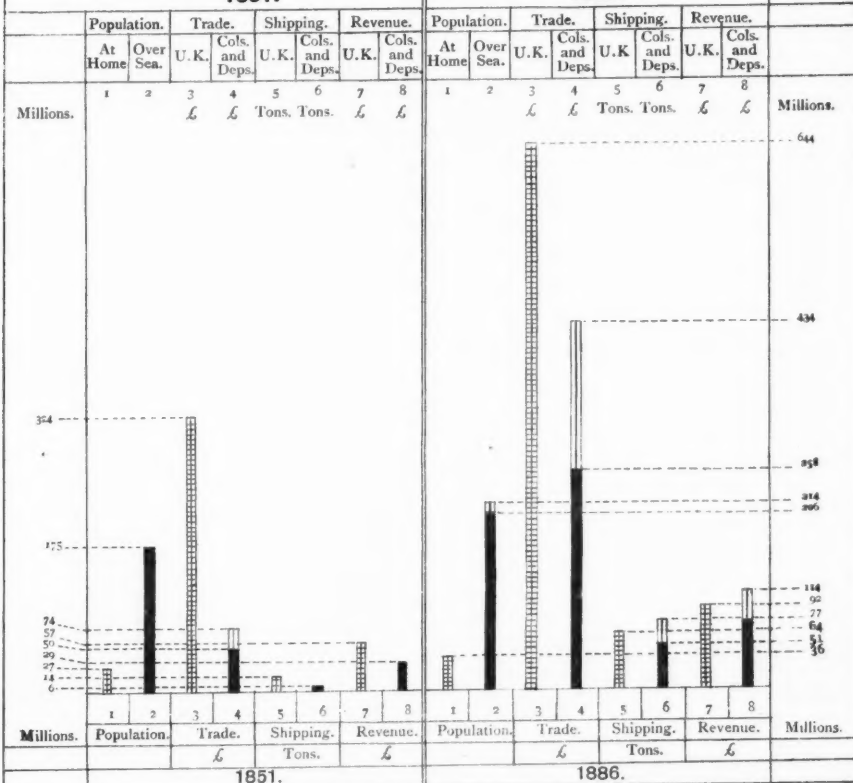
Millions.
1,079

TABLE No. 6.

DIAGRAM OF GROWTH.Population. One year's Trade, Shipping, and Revenues of the United Kingdom,
and of the Empire beyond Sea. 35 years ago and now.**EXHIBITIONS.**

Period of International.

Period of Colonial and Indian.

1851.**1886.**

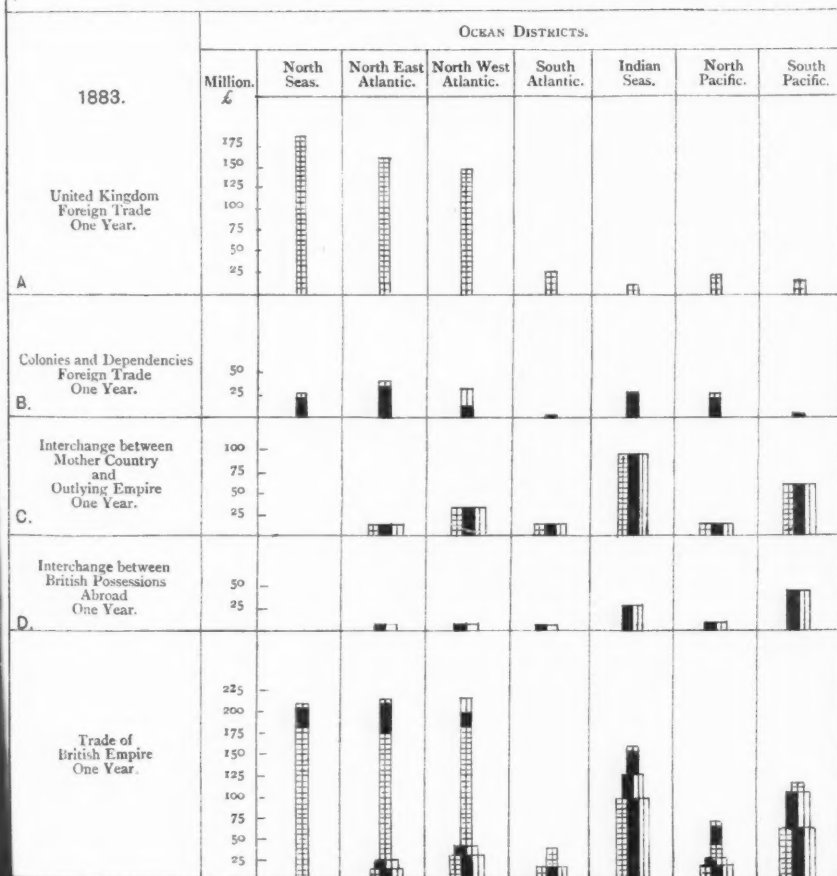
N.B.—The numbers at top and bottom of each figure of the Diagram are for convenience of reference. The side numbers express millions of £ in the case of Trade and Revenue; of Tons entered and cleared in the case of Shipping; and of numbers of persons under the head of Population. Six millions is the lowest figure admitting of illustration by diagram on this scale—hence, as the Population, the Tonnages, or the Revenues of the Colonies did not in their aggregate amount in either case in 1851 to six millions, they cannot be shown.

J. C. R. COLOMB,
Capt late R.M.A.

DIAGRAM

TABLE No. 7.

Showing by Ocean Districts the value of One Year's Trade of the British Empire—distinguishing between Foreign Trade of the United Kingdom—the Foreign Trade of the Colonies and Dependencies—the interchange between the Mother Country and the outlying Empire—and also the interchange between British Possessions abroad.—1883.



Colonies thus... [Pattern]
Dependencies [Pattern]
United Kingdom..... [Pattern]

DIAGRAM

TABLE No. 8.

Comparing the Trade and Revenue of Countries having sea boards on Pacific Ocean only.

	Trade in Million £			Revenue in Million £	Remarks as to effective Naval power.
Millions.	25	50	100	25	
Peru	4			4	Destroyed in War with Chili.
Japan	△			△	7 Sea-going modern Cruisers, etc., etc.
Chili	△			4	8 do. do. do. do.
China	△			△	7 do. do. do. do.
Australasia					Maintains no Ocean Cruisers.

DIAGRAM

TABLE No. 9.

Showing aggregate of Area ; the Annual Trade ; Revenue (and the Expenditure on War Forces) of British North America, South Africa, and Australasia, as compared with the United States.

Our
Colonial Empire
of
British North America,
British South Africa
and
Australasia.
7,106,174 Square Miles.

Area.

United States.
3,095,245
Square Miles.

OUR COLONIAL EMPIRE.				THE UNITED STATES.			
Million. £	Trade.	Revenue.	Expenditure. on War Forces.	Trade.	Revenue.	Expenditure on War Forces.	Million. £
176							293
37							72
							11
£	275,442,762	37,522,423	802,559	293,299,000	72,608,000	11,737,714	£
	1	2	3	1	2	3	

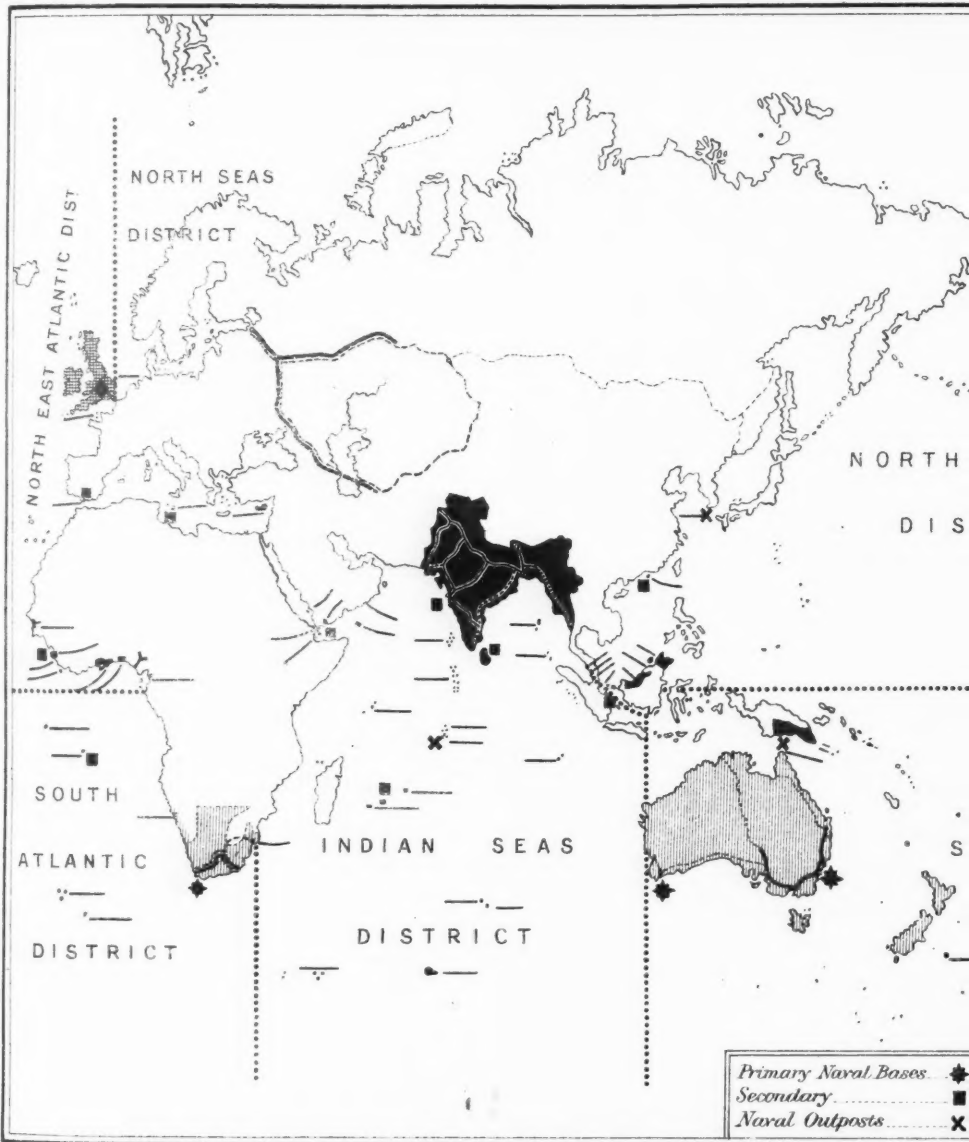
N.B.—This Diagram excludes from the comparison the United Kingdom and the Empire of Dependencies, *i.e.*, India, etc., etc.

J. C. R. COLOMB,
Capt. late R.M.A.

STRATEGICAL SKETCH OF THE INDIAN OCEAN TO ACCOMPANY LECTURE & DIAGRAMS ON IMPERIAL DEFENCE

Journal R.U.S. Institution.
Vol. 30.

by J. C.R. Colomb, former

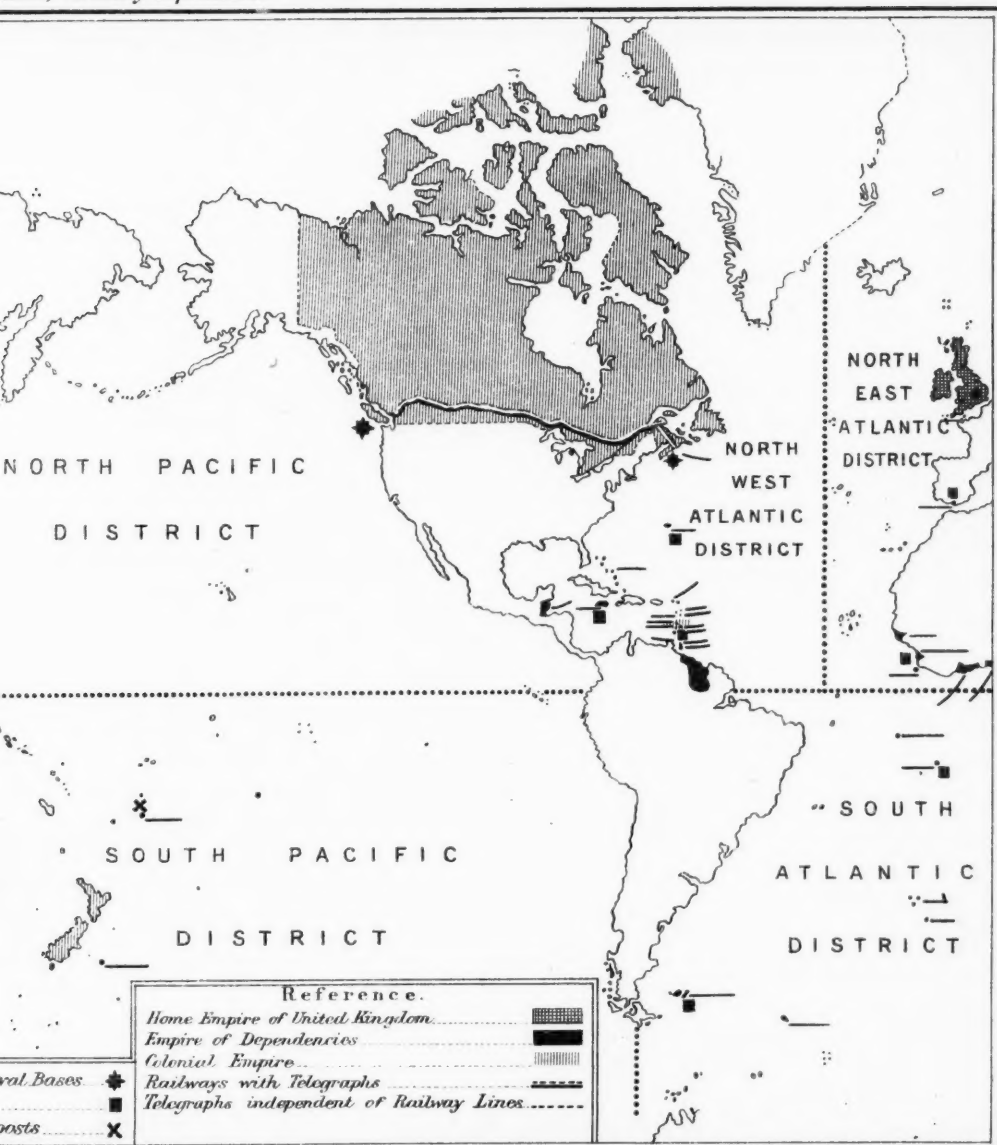


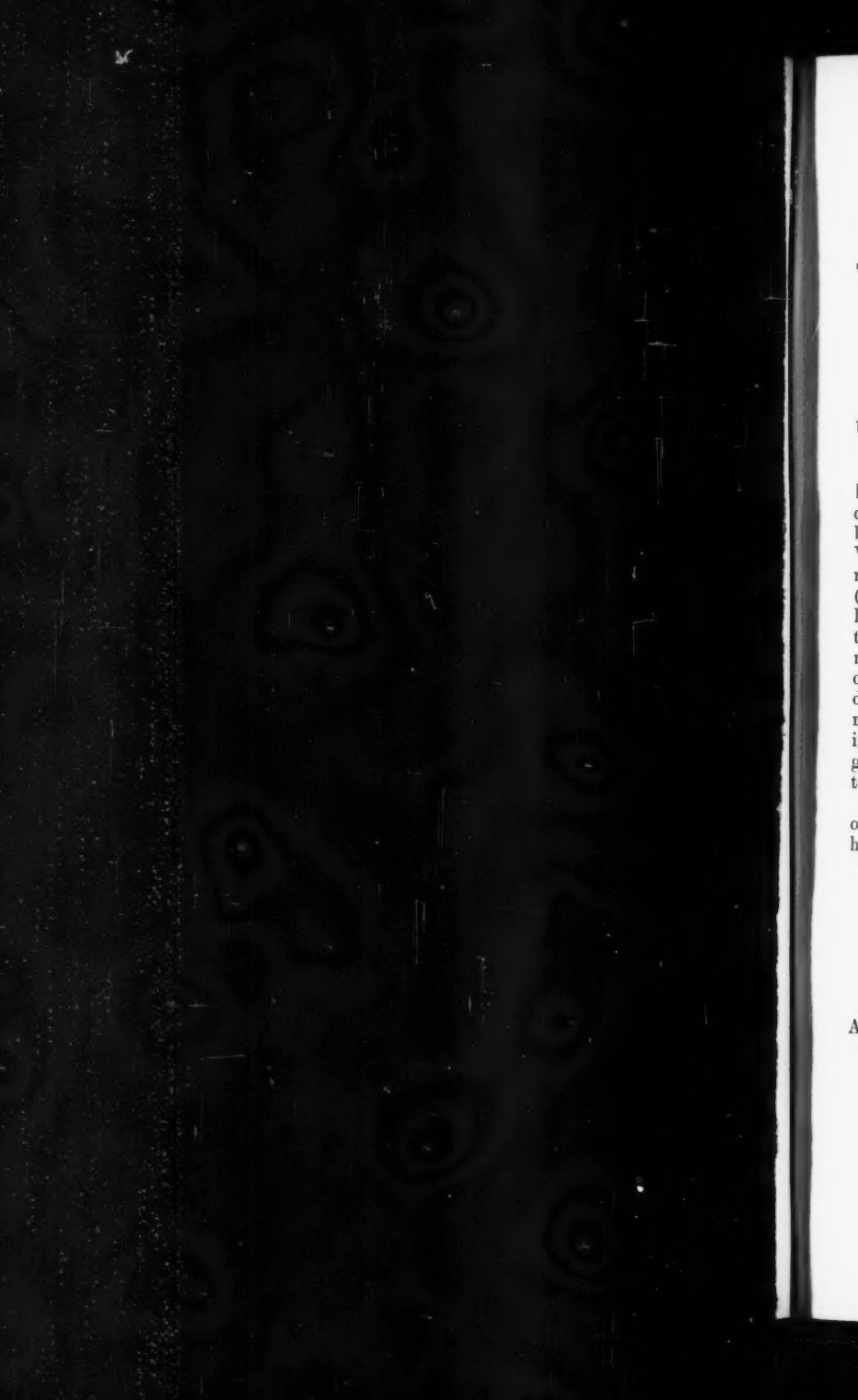
Designed by Capt. J. C.R. Colomb.

MAP OF THE BRITISH EMPIRE BASED ON IMPERIAL FEDERATION, NAVAL & MILITARY.

Admiral, formerly Capt. R.M.A.

Plate XXI.





Wednesday, June 30, 1886.

THE RIGHT HON. THE EARL OF CARNARVON, some time Secretary of State for the Colonies, and Chairman of the Royal Commission on Defence of Ports and Coaling Stations abroad, in the Chair.

IMPERIAL FEDERATION.

What we,—the advocates of Imperial Federation,—aim at is the closer Political Union of all the Dominions of the Queen of Great Britain and Ireland.

By Colonel Sir CHARLES H. NUGENT, K.C.B., late R.E.

RUSKIN opens his work on the "Stones of Venice," by setting up for comparison three States, which have risen to eminence above all others by the dominion asserted by their children over the ocean, Tyre, Venice, England, and, says he, of Tyre, only the memory remains,—of Venice, only the ruin,—of England, which inherits (?) their greatness, that if it forget their example, it may be led through prouder eminence to less pitied destruction. Suggestive of serious reflection as this passage must ever be to English readers, it is most suggestive, to me at least, when in his farther description of the State of Venice, I reach that paragraph which describes how an agitated democracy developed into an elective monarchy, gradually limited and shortened of its prerogatives, while increasing in spectral and incapable magnificence, until in the final government of the nobles under the *image* of a king, Venice reaped the fruit of her former energies, consumed them, and expired.

To some memories will no doubt recur the words in which a poet of this century, standing by her still and death-like waters, depicts her past glories, while describing the present condition of Venice:—

True her high spirit is at rest,
And all her days of glory gone,
When the world's waters, east and west,
Beneath her white-winged commerce shone,
When with her numerous barks she went
To meet the Orient Empire's might,
And her Giustinianis sent
Their hundred heroes to the fight.

And the scathing denunciation with which he leaves her:—

Mourn not for Venice, though her fall
Be awful, as if Ocean's wave
Swept o'er her; she deserved it all,
And Justice triumphs o'er her grave.
Thus perish every king and state
Which runs the guilty race she ran!
Strong but in ill, and only great
In outrage against God and man.

MOORE (*from memory*).

Amidst the enthusiasm, chivalry, or fanaticism of the other States of Europe, Venice was roused to action only by the touch of a secret spring, that spring was her commercial interest, the one motive of all her important political acts or enduring national animosities; she calculated the glory of her conquests by their value, and estimated their justice by their facility.

To the thinking mind which endeavours to forecast the course of the future by the teachings of the past, there is something eminently suggestive in this description, and I find myself constantly asking myself the questions, Are we such as Venice was? Shall we, too, end like Venice?

Time would not avail me to show how much of the resemblance between England and Venice is seeming and superficial; how much, how *very much*, is due to the masterly touches which the great word-painter, in his absorbing devotion to his art, puts in to give form to the whole, and to complete his picture in accordance with his own ideal.

There is, however, one most weighty consideration to which Ruskin does not—at any rate does not seem to—assign its due share in the rise and fall of Venice, and its due share in the present position of England, and that is, in each case, the *genius of the nation*. We may be unable to say to what the differences of national genius may be due, but we can at least say that they are in part due to physical influences, such as situation, climate, and soil (Cunningham, "Policies and Economies," p. 135). And herein I find much ground for satisfactory reflection: in these three most essential conditions Nature has so highly favoured England.

No doubt it may be said that the tendency of national genius has been in the case of each to the acquisition of national wealth; but the question what is national wealth will receive a very different answer at different times, and in different countries. We need not stop to inquire what was the Venetian conception of national wealth, but this much we may assert, that it was very different from the present English conception of national wealth, the function of which may be stated as the maintenance of life, the maintenance of as noble a life as may be, and for this a most important requisite is a vigorous and skilful population. Industry is the true source of wealth;—our Colonial Empire, as well as experience within our own land, confirms the truth that a vigorous and industrious population is the true source of wealth. You will find, if you pursue this subject, that health, skill, and moral character are necessary elements if the national life is to be sustained and *prolonged*; it was in this necessity for *prolongation* that Venice fell short; she did not comprehend that national wealth consists of all physical objects, which have not only to sustain, but to *prolong* the national life.

It is the pursuit of this national wealth which has raised this country to the pinnacle of eminence upon which she stands; it is the energy and industry of her sons which have enabled her to outstrip all rivals, and in doing so have placed the carrying trade of the world in her hands. This is a wonderful position, but in the achievement of this position the whole condition of things in England has changed;

the population has increased enormously, but the land no longer supports this population to the extent it did; the average mode of living has risen to a higher standard, and the average cost of living has risen with it, and it has come to pass that many of the necessities of life can be raised at a far less cost in other and far distant countries, where labour is perhaps not half the price it is here: can not only be raised, but be raised and carried to this country, and here sold at prices with which the English agriculturalist finds himself in many cases unable to compete.

You can form some idea of this when I tell you that the British imports exceed the exports by 187,092,106*l.*:—

United Kingdom.

Imports.....	£426,891,579
Exports.....	239,799,473
	<hr/>
	£666,691,052

and that upwards of 100 millions of the imports are for foodstuffs, meat, animals, grain, flour, and vegetables. Now in this respect our position in Europe is, and not in Europe only but in the world, almost unique. With the exception of France and Italy, all the other great nations of Europe are self-supporting; and in France the imports are to the exports as 231 millions to 182 millions:—

	Imports. Millions.		Exports. Millions.
Germany	164	to	166
Russia	130		129
Italy	52		47
Austria	29		34
Spain	33		34
United States	115		148

But we depend upon foreign countries for more than half our food supply; thus we import 1 lb. of wheat or flour daily, and $\frac{1}{4}$ lb. of meat daily,—per head of the population,—to say nothing of tea, wine, and spirits.

Competent authorities estimate that by 1891 the population of these islands will have risen to 40,000,000, an increase in the intervening five years of 3,600,000; then still less will the land support the population, and the imports of food, which now amount to 2*l.* 15*s.* per head, will probably be not less than 4*l.* per head. 2*l.* 15*s.* appears to be an abnormally low figure; the year preceding it was 3*l.* 9*s.* per head.

In the changed conditions of labour, owing to which the agricultural population is being gradually withdrawn from the land to overpeople the manufacturing cities, the health of a large section of the nation suffers prejudice: it is true that the tables of mortality show progressive increase in the duration of life, but this increase cannot

be the rule for a large section of the manufacturing class. In skill we have improved, I believe, upon our predecessors. In moral character—well, it is difficult to speak with certainty respecting this element of the national life. In reflecting upon it, it occurs to me sometimes that we are no worse than our predecessors, but certainly it never occurs to me that we are better. Nevertheless, I believe that the bulk of the nation, especially in the middle and lower classes, is sound at heart.

Yet in spite of this, the present state of things in this country is very unsatisfactory,—indeed the present is a serious crisis in the national life. Trade is depressed, capital is idle, production, overstimulated here and in other countries also, is restricted, distribution is contracted, and a great number of men are without employment; the whole world seems to be suffering from want of markets. Some advanced thinkers have arrived at the conclusion that this will recur periodically,—that, with the facilities for intercommunication, by which the wants of one people are brought within reach (to the very doors) of another, the competition will be so keen, that the tendency of supply will be to exceed the demand, and that the markets of the world will be always swelling up to the point of repletion.

If the state of things be so with us now,—what will it be five years hence when four millions are added to the population? What will it be when we are engaged in an European war?

I have already told you that we depend upon foreign countries for half our supply of food, but if this supply were suddenly cut off, what would become of us? And it might be cut off,—the operation would not be very difficult,—for this supply of food comes from long distances—from America, from India, from Russia, from Australia—and passes within striking distance of countries envious if not unfriendly, and which may at any moment become hostile.

But in considering this matter of striking distances our view should not be restricted to Europe; Russia is an Asiatic as well as an European Power,—indeed it is as an Asiatic Power that she should be a source of anxiety to us,—as I have pointed out on previous occasions here, the Naval and Military Establishments which she has formed and is perfecting in the Pacific, seem scarcely called for by the circumstances of her Empire in that Ocean, and are well placed for offensive operations against Australia, England, and the seaboard of our Indian Possessions.

Conversely, how infinitely stronger becomes our position in India, with a wealthy, contented, and United England in Australia.

Nor is it to Russia only that we should look in Asia. China, with its enormous population and its distinctive civilization, which, while it parts its children from amalgamation with Western races, does not preclude the assimilation of Western ideas, and the adoption of Western military methods, must be a cause of anxiety to our kinsfolk in Australia,—even when China is confined within the limits of her own territories,—and must be still more so when her children flow over the islands and shores of the Pacific.

Japan, too, though smaller, manifests similar tendencies, but to a

higher degree, and must claim attention. These two nations, even if not formidable in themselves, may readily become so under European leaders, and many of our difficulties in the East have been due to Native Troops led by Europeans. The Chinese under a second Gordon would be formidable adversaries.

The lessons of the past will have been in vain for us if we lose sight of the part played by France in the War of Independence. France, while at peace with England, assisted America for two years, and indeed virtually fought the War of Independence. The France of that day is the France of to-day, and will remain so,—as long as France is France and England is England. So also Holland, while at peace with England, was actively assisting the Americans for two years before England declared war with her.

Defence is in reality the Prime Factor in all Federations. I am aware that this matter of Defence is sometimes deliberately put aside, under the apprehension that the cost involved in it may frighten the lukewarm into opposition, but I venture to think that this apprehension is misplaced, and that our kinsfolk beyond the sea are more able individually, and quite as willing as we are, to take their share of the cost.

In previous papers read before this Institution, I have shown that the measures necessary for safeguarding our commerce, and of course in it our food supplies, are neither very difficult nor inordinately costly. Captain Colomb has fully placed the military aspects of Imperial Federation before this Institution, in his paper read here on the 30th ultimo, and I will content myself by merely indicating what measures are necessary. Stated in the most general terms they are: thoroughly defended ports and arsenals at home; thoroughly defended ports and naval arsenals at carefully chosen places abroad; intermediate refitting stations, nearly all of which are already in our hands, also thoroughly defended; efficient and strong patrols maintained on the well-defined passing places, where the Ocean Trade Routes converge, and which are not many in either hemisphere.

One thing is certain, that if this food supply were cut off, we could not revert to old economic conditions; we could not fall back upon agriculture, the land in this country will never again support the people. Possibly, though I am unable to see in what direction the possibility lies, an altered economic condition may develop itself to meet the altered circumstances of the case.

If this food supply were cut off, we should drag on, well, perhaps for six weeks! and then if we fought our way through, as I cannot doubt we should, we should have lost perhaps for ever a large portion of our carrying trade, which is literally the bread of our national life.

People do not sufficiently realize the vital importance to us of this carrying trade, indeed, they cannot do so unless their attention is directed to it; the total reaches the vast sum of upwards of 1,000 millions per annum, and the profits which the country realizes upon this must be very large;—it finds employment for 220,000 sailors, not all British sailors to be sure; a cessation of trade then would,

amongst other evils, mean 200,000 men lying idle and demanding food. Ships representing 74,000,000*l.* capital out of employ, and at least 70,000,000*l.* trading capital unable to earn income, the result would be fearful to contemplate, and I cannot doubt, to use a historic phrase, that we should be within measurable distance of revolution, and perhaps of anarchy.¹

Some will no doubt say that this danger is not great, and at any rate may be easily exaggerated; it is not my wish to exaggerate; no good is got by exaggeration. If we have avoided the danger hitherto it is rather because we are strong, wealthy, and resolute, but strength is after all a question of numbers, and England, more densely populated than the great European nations, is less capable of expansion than they are. Yet even as it is have we no rivals? We hold our place by great exertion, and look what efforts Germany is making with her already larger population of 45 millions, to gain a share in the carrying trade of the world,²—the vast sums she has spent or is spending on her two fortified ports of Kiel and Wilhelms-hafen,—the money she contemplates spending on the ship-canal across the neck of the Jutland Peninsula, by which the Baltic will be united to the North Sea; her measures, which do not always commend themselves to our ideas, for planting Colonies: her policy of State subsidies to all the large lines of steamers which trade to these Colonies,—all point to a steadfast pursuit of, if not the Empire of the Ocean, at least a share in the commerce moving over the waters, and recollect these Germans are good colonists, possessed of many admirable qualities, thrifty, manly, and persevering; already considerable success has attended their efforts in Europe, and English goods are in many places being thrust out by German goods.

"Von Hubner says the Germans prosper here (Fiji) as in all other parts of the globe wherever they settle. Their activity, their intelligence, their spirit of economy and their sobriety are warmly praised. They are strangers alike to luxury and any form of extravagance."—(*Brit. Emp.*, vol. ii, p. 294.)

Travelling last autumn in Denmark, I was much impressed by the observations of a Dane with whom I fell into company; he remarked to me how their country was being flooded by inferior German cloths. He said that his countrymen were very constant in the use of broad cloths, and of the same description of cloth, that they had been in the habit for generations of getting such from England, but that the Germans had pushed in of late, and by dint of perpetual touting were securing the market, though, added he, if the English took the same pains, the Danes would not look at German cloths; but the English were too proud to tout for small orders, and so "they are losing our trade because they do not think it worth pushing for; the

¹ 150,000,000*l.* idle, represent a loss of say 10,000,000*l.* of income, and cost of feeding 200,000 idlers 5,000,000*l.* more, a total annual loss of 15,000,000*l.*

² Between 1874 and 1883 the exports from Germany to the United Kingdom rose from 20,000,000*l.* to 28,000,000*l.*, while the imports to Germany from the United Kingdom fell from 24,750,000*l.* to 18,750,000*l.*: that is, in the nine years Germany gave us 8,000,000*l.* more, and took from us 6,000,000*l.* less.

fact is the German will strive for a penny in a way an Englishman will not for a shilling"—I don't think the Englishman is the wiser.

This matter of numbers being of such importance, no Englishman can notice without concern the tendency of peoples to empire themselves in great nationalities,¹ this process of the absorption of the smaller by the greater has been going on steadily throughout the past century. Cast a handful of globules of quicksilver upon a smooth dish, agitate the dish slowly and you will see the smaller globules uniting to form larger,—the smaller globules still left falling into the nearer larger,—until, as the movement proceeds, only one mass remains. This is the process going on throughout Europe, the larger communities are steadily absorbing the smaller; look what has happened in Poland, in Finland, in the smaller States of Germany, in Savoy, in Schleswig-Holstein, in Alsace and Lorraine, and in Montenegro. Consider what may happen in the case of Holland, of Belgium, of Denmark, of Portugal: it does not need a far-seeing eye to forecast the period when the Continent of Europe shall be apportioned between Slavonic, Teutonic, Latin, and Greek nations.

When this happens, what shall be our position? The population of these islands will be insignificant in numbers beside the magnitudes of these nations. If our Empire be then limited to these four seas, we shall be indeed insignificant, the Holland of that day with our carrying trade departed, leading the existence of sufferance only. Is such an existence worth leading? Every man must answer this as his feeling prompts, but for myself I have no hesitation in saying, better that this country should be whelmed beneath the ocean than that that day should dawn upon it.

How are we to avoid such a future? And again the question I put to myself at starting rises within me: How are we to avoid the fate of Venice? My answer is, *by Federation*, for it seems to me—and the more I reflect upon it the more certain it seems to me—that our future rests upon the consolidation of a Greater Britain, by cementing into Federal union with us our Provinces beyond the seas.

The population of these Provinces already exceeds 10 millions of Englishmen. In these Provinces, which are of enormous area, is unlimited room for expansion, and by the time the population of the United Kingdom reaches the total of 50 millions, the population of these Provinces will be as many more,—in about fifty years according to Seeley.

¹ *Standing Armies.*

	Peace.	War.
Great Britain	239,000 ^a	559,000
France	524,497	2,500,000
Germany	445,392	1,535,400 ^b
Russia	550,538	1,010,601 ^c
Italy	750,765	1,021,954
Austria	272,400	1,039,586

^a, includes 44,000 Reserve.

^b, without Landsturm, and 14 cadres, 11,000,000 additional!

^c, without Territorial Army and Reserve, 1,876,353 additional.

People do not sufficiently realize this capacity for expansion, it is one of the most marked features of these new worlds. Forty years ago my service carried me to North America; at that time the feeling of the Americans (I should say here that the inhabitants of the United States admit no others to be Americans) was distinctly unfriendly to us; rebellions in Canada in which American sympathizers had taken active part had not long been suppressed, and the question uppermost in men's mind was: would the States some day annex Canada? I confess that I was constantly filled with gloomy forebodings as to the issue of the rivalry between the two countries. England was so heavily handicapped, the sense of freedom of power of expansion seemed to afford the dwellers across the Atlantic more space for breathing, to invest them with a more vigorous type of life, to endue them with more independence; so that on my return after a prolonged absence, much as I found to admire in the movement and improvement in England, it was long before I could rid myself of an oppressive feeling of want of *elbow-room*.

This has been noticed by Von Hubner, who says of the Americans: "You feel you have to do with people who are open-handed, and who give you plenty of *elbow-room*."

To use Seeley's words, "In the Colonies are lands for the landless; prosperity and wealth for those in straitened circumstances; on the one side are men without property, on the other is property waiting for the men; if there is pauperism in Wiltshire and Dorsetshire, it is but complementary to unowned wealth in Australia." Who shall deny that we ought to strain every nerve to draw the Colonies closer to us? Federation will so materially help us in point of numbers, and numbers are strength, and especially strength in war—you know the old saying that Providence is on the side of the strongest battalions—but Federation will do more than this, it will afford an outlet for our redundant population, an outlet through which they will pass, not to go out from us for ever, but to gather fresh vitality and energy with which to come back to us in our time of need;¹ for in these Territories is room and to spare for all to live, and, if thrifty, to prosper; will open to us favourable markets, and will lay open to us lands of fertility from which we may draw without stint all the food supplies of which we stand so urgently in need.

But those who are not with us object that Federation, however desirable, is not feasible for us under the diverse conditions of soil and climate which obtain in our Colonies, and at their enormous distances from us. Let me at once deal with this matter of distance; distance is no bar, steam and electricity have done so much for us already, and their limits of power are not yet reached, that political union over these vast expanses of water is even closer and more certain than the union of 80 millions of Russians scattered over a territory, entirely land, of 2 million square miles; militarily too, the sea,

¹ The Colonies have ever shown this feeling—going further back than the late war, before the American Colonies were forced into separation, we find them saying, that in peace they cost Great Britain nothing; in war they contributed to the Imperial expenses, and would *continue to contribute*.—(Froude, vol. ii, p. 136.)

as we are able to put it to our use, is the best Line of Communication that Captain can desire.

It is recorded that when Cromwell assumed the Protectorate, the news was thirteen or sixteen days in reaching Devonshire. In sixteen days in this year of Grace you may go to America and back; in sixteen days the Home and Australian Fleets might concentrate in the neighbourhood of Suez. So much for distance. Distance was no bar to Cromwell; why need it be to us, who can by telegraph communicate almost instantaneously our wishes to the Antipodes?

The landing of William in Torbay in November, 1688, was not known in Shetland till the following May; but there was no regular post from Edinburgh even to as far north as Inverness until the Union in 1707, and for fifty years after that it was carried on foot (Lecky, England in the Eighteenth Century, vol. ii, p. 28).

And now for climate and soil. Climate and soil do not altogether fashion men's interests, though no doubt they play their part in shaping them. Attachment to the old country, which we still call patriotism; respect for law, upon which we rest our freedom; regard for domestic ties, which is our ideal of social duty; and the habit of manly self-reliance, upon which we justly pride ourselves, are not altered, are not even lessened by climate. As I write, Ingoldsby's clever rhyme upon the old Latin verse rises in my memory—

"Cælum non animum mutant qui currunt transmare."

"Climates, not men's minds, by travelling vary."

What have we further to encourage us in starting upon this course of Federation? We have Community of Race, Community of Language, Community of Religion, and we have primarily Community of Interests, though of course as time rolls on, local matters become of more absorbing interest than more distant matters; but however these interests may tend more and more apart, we have at least this strong interest in common—the interest for maintaining the connection between us.

Von Hubner remarks, "Much more is thought of the interests which separate the Colonies than of those which they share in common and which ought to unite them" (Through British Empire, vol. ii, p. 494).

What are the objects of Federation? Defence, External Policy, Extension of Territory, International Communication, Regulation of Commerce, Prosecution of Justice, Extradition of Criminals, Patent and Copy Rights.

Should the "Obligation of Contracts" be included? than which Maine says there is no more important point in the whole (American) Constitution; it is the bulwark of American individualism against Democratic impatience and Socialistic fantasy.

But again the objectors who ask "What is the good of Federation?" say, You have already got all these things—got in fact all that you want; the loose tie which binds our Colonies to us is sufficient—is indeed eminently suited to the disposition of the British people. *Let it alone.* The answer is, The Union we have is an Union of Sufferance,

and we cannot place absolute dependence upon sufferance. It is an Union of Sentiment, and we would place ourselves out of the reach of sentiment, believing that sentiment affords opportunity for caprice, as well as scope for the infirmity of Imperial Officials,¹ who seem not always chosen for their knowledge of the Colonies, and perhaps not unfrequently in requital of party services. It is an Union without responsibility,² and wanting in cohesion: moreover, the position is galling to educated Colonists, and the system is utterly irrational, if we can call that a system which grants representative institutions to one class of interests and withholds them from another.

Turned aside from this, they next object that Federation in our case is not feasible, and taking their stand upon the word which we have wisely or unwisely adopted, that there can be no such thing as *Imperial Federation*—that the course which we are pursuing will lead us to Sovereignty or Unitarianism, or, failing these, to disintegration. Moreover, they say that in the natural course of things the Colonies, as they arrive at men's estate, will separate from the Mother Country as ripe fruit falls from the tree; and they point, not without inward satisfaction perhaps, to the United States, which they consider a case in point.

At the time the American Colonies separated from the Mother Country the state of things was very different from what it is now. Colonies were regarded as *possessions*, not as parts of the Empire of England—as estates to be worked for the benefit of those Englishmen who remained at home. Thus Fronde says: "The lesson especially the Mother Country had never ceased to impress upon the Colonies, that they existed not for their own sakes but for her; she regarded them as created by herself,—as outlets for her own productions; they were strictly forbidden to trade with any countries but England or Ireland, or to ship their cargoes in any but English ships." On the one side was a King, almost alien, who, however little he cared for Hanover, and however much for governing England, understood and perhaps cared really very little for English interests at home, and still less for English interests abroad—a King³ who was unwilling to concede any

¹ Thus "Imperial Federation," speaking of Lord Granville and Mr. Osborne Morgan as the new Secretary and Under-Secretary of State for the Colonies, says of the former, he was Foreign Minister at the time the unfortunate arrangements for New Guinea and Angora Pequena were made; of the latter that he is chiefly known to the public through his connection with the Burial Bills, but the real grievance is that not a Colony throughout the world would have conceived the idea of nominating either Lord Granville or Mr. Morgan for his present post.—(No. 3, p. 69.)

² Responsibility must rest with supremacy. Where at present is the supremacy? In the British Parliament? Dare the British Parliament exercise it upon any self-governing Colony? You know it dares not, and if it did you can foresee the result. Von Hubner says, "I can see only one contingency in which the loyalty of a Colony might completely vanish, viz., a complete negative to some cherished aspiration of Public opinion."—(Vol. ii, p. 499.)

³ The King upon his side did his utmost to embitter the contest. It is only by examining his correspondence with Lord North that we fully realize how completely at this time he assumed the position not only of Prime Minister but of a Cabinet. Military management, the course of the war, the manner in which Government ques-

but a mere dependent *locus standi* in national matters to the Colonies, was unwilling even to admit that they could have interests apart from or which might conflict with home interests, and yet who, alien as he was, was able to impose his bigoted, narrow, anti-national will on the dull pedantic Ministers who served him.¹

On the other side were the Colonies, no longer finding it necessary to look to England for defence, harassed vexatiously and injuriously by England's commercial policy, which was directed to a monopoly of the Colonial trade, and was indeed the prime cause of the disruption,² having little or no part in English social matters, apprehensive of being dragged after England into Continental matters, which were of no immediate concern to them, resenting being taxed in the interests of those who professed to be their brothers, and yet treated them as if they were a conquered people.³ Add to this, too, that they were not Colonists in our present sense of the word; they were not the overflow of the Mother Country; they were religious communities⁴ which committed themselves to the dangers of the unknown ocean in order to exercise beyond its troubled waters those rites of religion the free practice of which was proscribed to them at home. What wonder, then, they burst the ties which held them,—and galled them while they held them,—and severed the connection with the Mother Country?⁵

tions were to be argued in Parliament were prescribed by him, and Ministers acted simply as his agents and in direct opposition to their own judgments.—(Lecky, vol. iv, p. 471.)

¹ It appears from the correspondence that for about five years North at the entreaty of the King carried on a bloody, costly, and disastrous war in direct opposition to his own judgment and wishes.

Lord Barrington, who was Minister of War, disapproved of the policy of coercing the Colonies; believed the military enterprises he organized would lead to nothing but disaster, that the Americans might be reduced by the Fleet, but could never be by the Army, and yet obediently carried out the King's plan for the Government.—(Lecky, vol. iv, p. 471.)

² As early as 1748 the Swedish traveller Kalm was told that within 30 or 40 years the English Colonies may constitute a separate State, independent of England—these dangerous neighbours (the French) is the reason why the love of the Colonies for England does not wholly decline.—(Lecky, vol. ii.)

³ As early as 1776 Turgot wrote: "Wise and happy will be that nation which shall first know how to bend to new circumstances, and consent to see in its Colonies allies not subjects."

⁴ 20,000 Protestants left Ulster on the destruction of the woollen trade. Many more were driven away by the first passing of the Test Act, and in the loss of independence, England had no fiercer enemies than the descendants of these . . . Presbyterians, Puritans, Independents, in search of wider breathing space than was allowed them at home . . . Vexed with suits in the Ecclesiastical Courts, forbidden to educate their children in their own faith, treated as dangerous to the State which but for them would have had no existence, associated with Papists in an Act of Parliament which deprived them of their civil rights, they saw at last that the Liberty for which they and their fathers had fought was not to be theirs in Ireland.—(Froude, vol. i, pp. 268, 391; and vol. ii, pp. 130, 132.)

⁵ The King was never what we should call a really Constitutional King—his own words, which are too clear for cavil or dispute, prove this. He said that "no advantage to *this* country, no present danger to *myself*, can ever make me address myself to Lord Chatham or any other member of the Opposition." The King adopted the same line later, in 1804, with respect to Fox, and in March, 1782, when Lord North's Ministry came to an end, it is said he contemplated abdication and return to Hanover.

If we drift as we are now drifting, we shall no doubt arrive at disintegration, but disintegration will not be our goal, will be only the first stage on the road to *national effacement*. Now we, the advocates of Federation, have no intention of travelling on that road, and that is why I am here to advocate an Union, under the name of *Imperial Federation*, upon which we can rely in the future.

But supposing the course we are pursuing does lead to *Unitarianism*. Myself, though I prefer a more orthodox Federation, I have no antipathy to this *Unitarianism* (the habitual exercise of supreme legislative authority by one central power, which in our case is the British Parliament—Dicey, *Law and Constitution*, p. 127), by which I understand that somewhere in our Constitution there is an ultimate point of supreme authority or Sovereignty. *Unitarianism* has served us so well, seems so well suited to the genius of the Nation, that we may expect it to suit our offspring equally well, especially as the Constitutions under which they flourish are all based upon this underlying principle, that the ultimate authority is the expression of the influence of the citizens upon the State—is indeed the outcome of the force of Public Opinion.

It may be urged that this *Unitarianism* answers our purpose so well here in Great Britain, because the unit, the directing authority, is so immediately with us, is *we ourselves*, we, by our influence on the State, we, who are the Public Opinion, but that it will not subserve the same purpose, or at least to the same extent, in influencing and moulding the integral parts of Governments so distant from us as the Colonies, or rather of the Empire as a whole comprising the Colonies. If that be so, though it is open to doubt, let us get rid of the Unitarian principle, and adopt any other form of Federation,—or Union,—by whichever name you call it, which we may find more suitable. There is no one and only specific for Federation. The United States is generally referred to as the most perfect type, but it is by no means perfect,¹ and there are other and very different types, as the Dominion of Canada and the Republic of Switzerland.

Of the United States, Bagehot says of the Electoral College which the founders of its Constitution hoped would be composed of the wisest people in the nation, that "it is a sham without independence and without life,—no one knows or cares to know who its members are; they never discuss; they never deliberate; they are chosen to vote for a particular man, they do so vote, and they go home." "So President-making is a trade in America;"—"International Policy rests not with the President,—not with the House of Representatives, but in the Senate;"—"The President wants one course and has power to prevent any other;—The Congress wants another course and has power to prevent any other."—(Expan. Eng., pp. 153, 222, and 256.)

A very large and increasing body in all the Colonies is desirous of

¹ The Constitution of the United States is coloured throughout by political ideas of British origin, and is in reality a vision of the British Constitution as it must have presented itself to an observer in the second half of the last century.—(Maine's *Popular Government*, p. 207.)

a closer connection with the Mother Country, by whatever name that connection is called, and leagues have already been formed in most of the principal Colonies, and in many of our principal towns, but as a member of the New Zealand Legislature remarked in discussing the prospects of Imperial Federation, "Our great difficulty really is the want of the Imperial idea in the British isles, they have got into such a way of looking upon themselves as the Empire, that they have not yet awoke to the fact that there is a Greater Britain outside of Old England." No doubt this problem has difficulties of its own, immense difficulties, but the greatest of these difficulties is one which we make ourselves. It is the false preconception which we bring to the question, that the problem is insoluble, that no such thing ever was done or ever will be done; it is our misinterpretation of the American Revolution.—(Expan. Eng., p. 159.)

We, the promoters of the Federation League, aim at awaking these people, to many of whom Federation has no real meaning;—perhaps some here present have scarcely heard of it, and yet I am convinced that at this moment it is the question of most importance to Great Britain,—at any rate it is a question of absorbing interest to our kinsfolk in the Colonies.

I alluded before to the depression of trade, but most people are not aware from how much deeper a state of depression our Colonies have saved us. In the decade ending 1882 our exports decreased 8,000,000*l.*, viz., from 314,000,000*l.* to 306,000,000*l.*, but during that same decade our business with the Colonies increased 26,000,000*l.*, so that had it not been for the Colonies the decrease would have reached 34,000,000*l.* per annum. Well indeed for us that the Colonies came to our aid!

It has been noticed too that our trade with the Colonies is more steady than our trade with foreign countries,—and, comprising mainly articles of dress and of domestic consumption, and finished manufactures, finds employment for British labour, in trades in which Dr. Watson considers one-third of the population of the United Kingdom is employed; moreover, the same authority points out that the consumption of such articles is more than half as much again in Australia,—viz., 3*l.* 4*s.* there as compared with 2*l.* per head,—in England.

But steady and rapid as is this trade, it would receive enormous developments as our food supplies were drawn more and more from our territories beyond the seas. I took occasion to urge as long back as 1884 that by direction our food supplies might eventually be derived altogether from our own territories, and the strength of this country would be enormously increased if she were thus self-dependent.

A question often asked is, What will the Colonies gain by Federating? but the question should be rather, What will the Colonies lose if they do not Federate? In the case of Canada, Principal Grant, in reply to the question, What would Canada lose by independence? answers, Almost everything that a country needs.—(Imper. Fdr., No. 4, p. 193.) We are not inviting aliens more or less un-

willing to join us; then indeed it might be with them a question of the balance of advantages; we are urging upon our kin that they should not go out from us. This distinction is material, because evidently it may be to their interest not to leave us, though it might not be to their interest to enter into union with us; but premising that it is both inexpedient and unnecessary to balance this question with too much nicety, we may with profit devote a little consideration to it. The primary object of all Federal Unions is defence.¹ Now it may be said that if the Colonies by standing aloof should free themselves of all obligations in the matter of Imperial Defence they would free themselves from enormous responsibilities, and this is no doubt true as far as Europe is concerned, but they would remain exposed to greater perils in the event of a war of the first magnitude in which Great Britain was involved, and would rely for their existence upon the forbearance of others, for at present they are not, and for some time to come the strongest of them will not be, in a position to stand alone. Moreover, a great Empire with interests in every quarter of the globe is not likely to go to war for a merely local or frivolous object.—(Our Colonies and India. Ransome, p. 100.) In the matter of defence, then, the Colonies are no losers by closer union, while closer union means the advantages of British capital, increased security for commerce, favourable markets, and such other benefits, moral and material, as arise from membership in Great Britain, the freest, the wealthiest, the most glorious Empire the world has ever seen. This latter consideration cannot be rated as little in the scale, with some indeed it has most weight. In England we are so used to regard this membership as part of our birthright that we perhaps do not estimate the advantages and privileges attendant on it at their just value, but how they are esteemed by others is well shown by the natives of India, one of the reasons of whose wish to be enrolled in the Volunteers of India is "pride in the association with a noble Empire like that over which Her Majesty presides, and a desire to share in its glories by being numbered among its defenders."—(Colonies and India, p. 121.) If our kinsmen beyond the seas, to use Seeley's words, "more alive to the responsibilities and dangers than to the benefits of the connection, have the heart to sever themselves from English history, from all the traditions and memories of these Islands where their fathers lived for a thousand years, it will indeed be necessary to think that England is a name which possesses sadly little attractive power."—(Expan. Eng., p. 155.)

It is scarcely possible to discuss Federation without saying something upon the commercial aspect of the question; to many the commercial difficulty stands most in the way of Federation, and so many advocate as the first step a Commercial Union. No doubt the commercial question bristles with points of contention, and I introduce it here that you may see that it has not escaped the attention of the League. Already the advocates of Protection and Free Trade are

¹ The Australian Colonies may soon be in a position to defend their own shores, but it will be long before they are powerful enough at sea to protect their Commerce, already important and steadily increasing.

confronting one another, while a third party which calls itself Fair Trade is eager to plunge into the fray, though with regard to this party, and without pledging myself in either direction, I may say that it seems to me that they must be either Protectionists or Free Traders; upon broad principles there would appear to be no middle course: yet the commercial difficulty need not appal us, the League does not press any view upon our Provinces beyond the seas; it sees that one or other view must be right, and that that view must eventually prevail, and in the meantime it is not apparent how these Provinces, though ever so closely united with the Mother Country, will be worse off than they are at present.

Protection would tax the goods of all Foreigners, and would lead to a war of Tariffs. Fair Trade would equalize taxation on British and Foreign products in the home markets, which seems to be Protection at home strictly regulated by Protection abroad; while Free Trade would leave commerce free to follow its own paths unfettered by restrictions of any kind.

Yet Free Trade is no new consideration for our Colonies; as early as 1775 Franklin, speaking for the Colonies, said if England would abandon her monopolies and give them Free Trade, they would contribute in peace. After the battle of Saratoga, Lord North sent out Commissioners, Lord Carlisle and Mr. Eden, to America, with power to offer to the Colonists Free Trade and seats in the English House of Commons, if America desired to be represented there.—(Froude, vol. ii, p. 204.)

This much, however, with regard to Free Trade, is indisputable, and should be borne in mind,—that Tariff disputes, a fruitful source of contention, would be avoided, and that the cost of collection, about 5 per cent. generally, would be saved.

Those who favour Protection are in the habit of pointing to the United States as the most prosperous nation in the world, and as having deliberately adopted Protection. I admit the prosperity, but it is a prosperity by no means untempered, and I for one prefer this old country, however it may be burdened. In reality, whether the States are better for protection is a moot point, but that their prosperity is mainly due to it is an assumption without warrant, and in any consideration of the matter we should not lose sight of the fact that the United States are in an exceptional position; they suffice for themselves, and being under no compulsion to resort to foreign countries for any of the necessities of life, are free to make any experiments they will.

Article I, Constitution of the United States, prohibits the United States, and the several States, from laying any tax or duty on articles exported from any State, and is, Maine says, the secret both of American Free Trade and American Protection. It secures to the producer the command of a free market over an enormous territory of vast wealth, and thus it secondarily reconciles the American people to a Tariff on foreign importations as oppressive as ever a nation has submitted to.—(Pop. Govrn., p. 246, 19th June, 1886.)

We, united with our Provinces beyond the seas, should be in much

the same position, and might create any Tariff we thought advisable in our own interests, though it can scarcely be denied that Tariffs increase prices to consumers, and that limiting our trade to our own Provinces would lead to much of our carrying trade passing away from us. At present we carry about two-thirds more than is necessary for our own use.

We do not lay down any particular formula for Federation, indeed we are particular to avoid formulating any scheme of Federation: we seek by continually ventilating the subject to familiarize the minds of all at home and in the Colonies with the idea of Federation, in the hope to induce them to wish for Federation, recollecting what Bagehot, who advocated Life Peers, said, "I am afraid we shall not soon see them, but as a first step we should learn to wish for them" (p. 127, Eng. Const.); that as a consequence there shall be spontaneous action from all sides towards Federation, and that out of this action shall be evolved that form of Union which most fits the circumstances of the case. This is an amplification of Taine's idea of our Constitution, which appears in his reflection, viz., that the mainspring of Government is not this or that institution, but certain energetic and very widely diffused sentiments, which we would more shortly designate as *Public Opinion*.

In the Colonies is an "ever-growing conviction of the impossibility of continuing in the same groove. The old machinery is worn out and must be replaced by new." But this much we do assume, that any League must be based upon *Representation*¹ of some form or another. It is so manifestly unreasonable to ask human beings to interest themselves, especially to the extent of self-sacrifice, in concerns in the administration of which they have no share, that we not only assume, but press, that they shall be admitted to a share in Imperial Representation. It is not for me to indicate how this may best be effected; it may be in the House of Commons; it may be in the House of Lords; it may be in the Privy Council; or it may be in a Council of Delegates from the Colonies, sitting under the Presidency of the Secretary of State for the Colonies. Difficulties attend the adoption of any of these, but the difficulties are not insuperable; modifications in the existing Houses will be needed, but modifications, nay reforms, are already insisted upon by many acquainted with their working, as absolutely necessary for both Houses even now; the tendency of the present seems to be towards placing local matters in the hands of localities themselves, in which case there may be no advantage in having so many members in the House of Commons, and thus room may be found for representatives of the Colonies in an assembly which will busy itself with none other but Imperial concerns. Who, too, can say what form reform of the House of Lords may take? Not improbably a more limited number of Peers, representative Peers and life Peers. Bagehot, discussing

¹ "Taxation the Colonies in 1767 would not submit to while unrepresented in the British Parliament" . . . "From authority to impose a tax, the step to despotism was short."—(Froude, vol. ii, p. 133.)

Lord Palmerston's proposal¹ to create Peers for life, says "the expedient was almost perfect;" thirty or forty such men added judiciously would have given "the House the very element which it needs so much, the most accomplished men in each department might have been added to it" (Eng. Const., pp. 122, 124);² at any rate the present House of Lords is not so in unison with the nation as its well-wishers desire that it should be.

In matters such as this of Federation, the hardest class to reach, and unfortunately it is the most numerous class, is the waverers,—the despondent, and the indifferent. What is to be said to them? To the despondent we would say that their spirit is not the spirit which led our forefathers to the acquisition of these Provinces beyond the seas;—is not the spirit which will enable us, their children, to maintain indissoluble the connection with them;—is not in short the spirit which has built up our Empire,—is not the spirit with which to encounter and to overcome difficulties. Upon them we would urge a more steadfast, a manlier policy,—we would urge that difficulties are not lessened by avoidance or by despondency,—that on the contrary, by constantly pondering them and turning them over in our minds, we shall become familiar with them, that familiarity will beget confidence in our ability to deal with them, and that confidence will issue in success.

But what is to be said to the indifferent? The indifferent may be indifferent either from ignorance or from apathy. The indifferent from ignorance we may educate, by "incessantly popularizing the principle" (of Federation) "by writing and speaking" (Bagehot, Eng. Const., p. 149), we may induce a spirit of curiosity which cannot but be beneficial. But the indifferent from apathy,—who are content with the existing condition of things,—who find it easiest to have no opinion,—who will not be at the trouble of following their fellow-men, so long as the exertion of following is more grievous than the penalties attaching to the isolation of indifferentism;—what of these? Of these indeed, unless from mere listlessness or the wantonness of indifference they lend themselves to unscrupulous and self-interested objectors, we need take little heed. If they are not for us, at least they are not against us, and even they may be roused to go with the stream, or if not roused may drift with the stream; yet whether they are or no is of little consequence, they are not the stuff of which men are made, they certainly are not the stuff of which the aggregation of men, which we call Empire, is formed.

* * * * *

To every individual of the sons of men there comes a time of

¹ The creation of Life Peers might be rendered more effectual by the removal from the Peerage of unworthy Peers: this is not an absolute innovation. In Edward IV the Duke of Bedford, Geo. Nevil, lost his Peerage on account of poverty.—(Forsyth's Cicero, p. 91.)

² The rejection of this proposal was due to Lord Lyndhurst, and thus "the House of Lords rejected the inestimable, the unprecedented opportunity of being tacitly reformed."

choice, it may be sooner or it may be later, but it comes at least once during his lifetime; sometimes the issues before him are not very clear, sometimes they are unmistakable; but however that may be, the whole of his future career depends upon his choice.

As with individuals so with nations, to the inexorable rule of fate is no exception:—the present, we, the advocates of Federation, are convinced is the time of choice for this, our Nation:—the issues are unmistakably before her—the handwriting on the wall is large and clear—so clear, indeed, that she can scarcely avoid reading,—and, reading, ought not to go wrong.

The individual who leads his life isolated, apart, wrapped up in self, soon ceases to be of account among his fellow-men; so no nation can live entirely absorbed in its own affairs, least of all can Great Britain, with interests far off, far asunder, in all parts of the world; it is puerile—ought I not to say senile?—to suppose it. Great Britain live apart, in isolation? Why her whole course of policy, past as well as present, proclaims that she cannot—that intercourse is her very breath of life!

If this be so, why should the League intervene? Because what is everybody's business is too often nobody's business; because the present is an age when too many find their own affairs sufficient for their whole concern—when from mere lack of initiative, cessation of energy may ensue. Our kinsfolk abroad want far less rousing than we at home; they have far more inquisitiveness than we have, are far more incessant in action. Already people in the Dominion of Canada are saying that the time is ripe for a choice between Federation and Independence, and this not from unfriendly motives, but actuated by the most pious and filial feelings towards the Mother Country. Independence, in their present stage of adolescence, would probably end before manhood is reached in annexation to the nearest Great Power; Federation is, we think, an end more worth striving for. With his mind fixed on the British Constitution, an eminent writer¹ says: "If the new communities of the colonized world have to choose a Government, they must choose one in which all the institutions are of an obvious evident utility," and, subject to its power of adaptability to altered and to altering circumstances, the Government of the United Kingdom appears to me to answer best this description. This, however, I may, for myself, say: I commenced some months back to study more closely than I had hitherto done the Constitution of the United States, under the impression that it was the best adapted to the needs of a free—let us say the Anglo-Saxon—race. I find in it many points of excellence, but I find in it also great anomalies—greater even than in our own Constitution,—anomalies not sanctified as in our Constitution by prescription. I find further in it a rigidity which presents many and great elements of danger; and my conclusion, my deliberate conclusion, is, that its excellence is in spite of itself, and through the people, of whom the writer already quoted says: "The Americans extol their institutions, and so defraud

¹ Bagehot.

themselves of due praise." "If they had not a moderation in action singularly curious where superficial speech is so violent, if they had not a regard for law such as no great people has yet evinced, and infinitely surpassing ours, the multiplicity of authorities in the American Constitution would long ago have brought it to a bad end."

The conclusion I draw is, that our race can adapt itself to many, to any, modifications of representative Government, and that there are no inherent objections to the Federation at which we aim; in that Federation lies the true development of the nation, upon that Federation rests the prolongation of the nation's life. What nobler incentive to exertion for each and every individual of the nation than the worthy prolongation of the nation's life? It is well to fix our thoughts upon this—to aspire ever to a higher ideal! We have seen the fate of nations habitually wrapt up in their poor selfish present, and by their fate we should take timely heed. We cannot rest as we are—we dare not go back; but we may, we *must*, go forward! The future is before us! Let us go forward towards it in no unworthy spirit; then, whatever the result, we shall leave ourselves little to regret. Yes, the future is ever man's goal! What are the words of the Seer? "Think not mournfully upon the Past—it is gone. Wisely improve the Present—it is thine. Go forth to meet the Future, without fear and with a manly heart." Noble words, and true to all time. What a glorious future! As we lift our thoughts towards it, we may well feel our hearts aglow within us. Standing here, with my thoughts lifted towards Federation, I dare affirm, without fear of contradiction, and with no feeling of unfriendliness towards other nations, that in the union of the English-speaking races rests the best hope for the future of the world. Join with us then, we beseech you, now, while there is opportunity, in our endeavour to render that Union close and indissoluble.

The CHAIRMAN (Lord Carnarvon): Gentlemen, before I call upon any one to address this meeting on the very interesting paper that we have just listened to, I think it right of me to say that I have received a telegram from Captain Colomb, who read a very interesting paper here upon a cognate subject at a recent meeting. Captain Colomb is engaged at this moment in one of those Parliamentary contests in which so many of our fellow-countrymen are now engaged, and he telegraphs to me to say it is a great disappointment to him to be unable to attend here to-day to carry on what was then understood, I believe, to be the promise of an adjourned discussion on his paper. Under these circumstances he hopes that though of course the meeting to-day may take into account his paper in the discussion upon that which we have just heard from Sir Charles Nugent, on the other hand that the door will be left open to him by a further adjournment, which seems to be very reasonable, a few days hence, when his own electoral labours will be completed, to enable him to say a few words on the paper that he then read to you. I think now my best course will be to invite discussion from those who are here present. I understand we are favoured to-day with the presence in this room of some of my Colonial friends, if I may be allowed to call them so, and if there be any of them here who would desire to speak on this subject, which so closely touches them, I am sure it would be the wish of this meeting to hear them in the first instance.

General BRAY, C.B.: My lord and gentlemen, I hoped very much to-day to see a great number of Colonists present to discuss this most interesting question in fact the burning question of the day before the whole British Empire.

would not have risen had it not been that for the last two years I have taken a great interest in this matter, and knowing a good many Agents-General and leading Colonists in England, I have discussed the matter in various ways and directions. I have heard a great many of their opinions, and have been able to form opinions of my own, and come to certain conclusions. From the admirable lecture to which we have just listened, a thoroughly statesmanlike exposition of the whole question. I gather certain things, and the first thing is, that Federation is in the air, and that it must come, and the sooner it comes the better. The only difficulty is how it is to be made to come. The Colonists are for it, you are for it, and everybody is for it, and it is only the difficulty which surrounds the subject which prevented it coming before now, and which at the present moment is keeping it back. But those difficulties unquestionably can be surmounted, will be and must be surmounted, and the way to do it is to approach this question carefully, and with the assistance of the most able men in this country, taking into their confidence all the leading Colonists in London who are able to give the opinions of the peoples whom they represent on this most important question. This year will be known in the future as the "Colonists' year:" there are so many of them here, and they are all watching the political movements going on at this particular moment, to see how they will affect them. Federation, though greatly desired, is surrounded with much difficulty, and is not considered by some practical at the present moment. The reasons are these, that each Colony, Victoria, New South Wales, South Australia, Queensland, Cape Colony, Canada, has its own Parliament, its own military force, and all the elements of government which exist in this country. These Colonists are represented in London by Agents-General. That is a name which does not give the people of this country an idea of what the duties of these gentlemen are: they really in point of fact are Ambassadors from the Colonies to the Government; they represent the feelings and wishes of the Colonies on every question, social and political. These men, therefore, are the go-between, who tell the Government in London what are the wishes of the Colonies upon all the questions which affect them. There are also the questions of Imperial policy and mercantile policy. Both questions have been carefully touched upon by Sir Charles Nugent, but the Imperial question is absolutely the one that affects the Colonies and the Empire more than any other, because at the present moment they all look to England more for the Imperial policy than anything else, that which affects them most, and in which they are almost totally unrepresented. The Imperial question is this. I will give you an instance: the point that touches every Colony connected with this country:—Is Ireland to be destroyed, separated, or abandoned? That point is an Imperial question for the Colonies; it goes straight to the heart, and affects their position in every possible way. I am only taking it as an instance; if Ireland were separated, this country, the centre and head of the Empire, would be weakened too. The weakening of the heart of the Empire would weaken the connection of the Colonies in every direction. The Turkish question at present, which is a very great European question also, affects directly the interests of the Colonies, because if the Imperial Government in London were to make war with Russia, they would be directly affected. They would be put to enormous expense, they would have to defend themselves and to be defended. That is another instance in which the Imperial policy affects the Colonies and the British Empire. The third is a minor one, which sprang up the other day, and caused a very great sensation in the Australian Colonies, that is the question of the New Hebrides. A Colonist said to me lately, "You, in England, are thinking of nothing but your elections; there is not a Colonist in Australia who is thinking of anything but the New Hebrides, and how it will affect them." It is absolutely necessary that in some form the Colonists should have some control or voice in the Imperial policy of the British Empire. That is the main point that affects them. Now in Australia itself there are several countries, all having their Parliaments, all perfectly separate, and some of them very jealous one of the other. It has been mooted that they should federate, and Federation has been distinctly sought in this paper. What are the objects of Federation? Defence, external policy, extension of territory, international communication, regulation of commerce, prosecution of justice, extradition of criminals, and protection of copyright. Those Colonists find the greatest difficulty in federating together on the spot, and several leading

Colonists have told me that they do not want to confederate together. What they want to do is to draw the lines closely together, and to be bound tightly with the Government of London. That is their idea of Federation. The Tariff question affects the Colonies acutely. If they had no Tariffs they would have smaller revenues. The Tariff and the Imperial policy are the main questions that they have to consider, and I trust the able lecture which has been delivered will bring forth good fruit, and show to the Colonies that we are with them in every way, and wish for Federation too, and will bring about this Federation the moment they show us how it is to be done, and how this great Colonial and Imperial question is to be solved in the best interests of the Colonies, and to the increased strength of the United Kingdom of Great Britain and the whole British Empire.

MR. RUSDEN : I did not come to speak in this theatre; I came here merely to hear the English opinions on this point. I was aware that Sir Charles Nugent, with whom I am a colleague in the Imperial Federation League, felt very strongly on this matter, but I thought he would bring before us the Imperial view, so that it might be considered by this audience. I did not think a Colonist would be called upon here to express any opinion. I may remark with reference to allusions to the Australian Tariffs, that it is not quite correct to say that the Colonial Tariffs are all arranged with regard to protection. There are some of the Colonies which themselves consider free trade highly. That they do arrange their revenues so as to get a good deal of help from the Customs duties simply for revenue and not for protection, is absolutely a fact known to all of us, but there are very few of them who have arranged them with a view to protection, in order as they think to increase local production. The great question of Federation is being warmly considered throughout every Colony, as well as in England, but the great difficulty, it occurs to me, will be in England itself. Has England lost the old power to organize a Government? If she has, we may blow this scheme to atoms. If she can rise again as a country with power of self-government, power of management, power of enterprise all over the world, then it may be done, but if she is to call upon the Colonies to dictate a scheme, the difficulties may prove insuperable. Doubtless no scheme can be adopted which the Colonists cannot agree to; but if England is to be supine under the hand of a demagogue, and to say that she has lost her power of government, lost her sagacity, then you may give it up, but if you will thoroughly consider this matter and organize and show that you have the spirit of your forefathers, then no doubt the Colonies will help you.

THE HON. H. HOLBROOK : I have listened with very great attention to the very admirable lecture of Sir Charles Nugent's, which contains a great deal for serious reflection on the part of Colonists. Now I come from British Columbia, the nucleus of whose population was furnished by the corps that Sir Charles Nugent came from—the Royal Engineers—and from them has emanated a really loyal and true community in that far distant country on the Pacific coast. We also know the great assistance that the noble lord sitting now in the chair gave in assisting us in being confederated together, for without his able assistance we should not have been the powerful Dominion that we are at the present moment. Now I might say as regards British Columbia, we were a Crown Colony, and his lordship was in office when we were a Crown Colony, and he assisted us in being confederated with the rest of the Dominion. But we had great difficulties. We were dependent nearly entirely on San Francisco, and we saw that the time had arrived when it was almost an impossibility to get emigrants to settle amongst us; we therefore found it our interest to join Canada. A Convention was formed and delegates came before the Dominion of Canada. We came into the presence of one whom Canada honours, whom Canada looks to as her greatest light—that is our noble Premier, Sir J. A. Macdonald—and whose great scheme, which was to cut the Gordian knot of your Eastern difficulty as regards Egypt, was the formation of a railway from ocean to ocean as a means of protection to your commerce in England. I may say with regard to the Colonies generally, we are about having a Convention at which delegates will sit representing some 250,000,000 of loyal British subjects, loyal to their Queen and loyal to their flag. They honour and esteem their Queen, they honour and esteem the flag, and they are proud of being amongst you. But although we claim loyalty, we do not want to make ourselves more loyal than you

are in Great Britain; but we claim equal rights, one flag, one country, and one nationality. We claim that as Colonists; and Sir Charles Nugent touched on this point in the very admirable lecture that he has laid before us showing the difficulties that there are in forming Confederation. Now Federation with England is a necessity. Here are your births over your deaths something like 440,000, and you have only sent to Canada 32,000 and to Australia 48,000. You are increasing your population and you must find outlets for them. Now in Canada we have land larger in extent than the whole of the United States, and only 5,000,000 on it, and I have told you we are loyal and true to our Queen. And when I say loyal and true to our Queen, it is no lip service. We have an army of 40,000 that can be increased to 300,000, and a reserve of sailors of something like 60,000, and with that nucleus we can show a bold front and all join together in one mass in Imperial Confederation. Australia can do the same as ourselves; we can render Great Britain impregnable. As I have said, we sent delegates to Canada to carry out the plan of Confederation with British Columbia; that will have to be done here, and the present Conference is a means. As regards your Tariff and protection, go to the Colonial Exhibition and see the prosperity of Canada in her manufactures; but you want our men, you want our statesmen amongst you; you want their counsel, and it is only through a Committee and the proper men being appointed that you can get their counsel. Whether it will be in the House of Lords or whether it will be in the Consultative Council, it is for heads greater than mine to think about, and for statesmen such as the noble lord who is now presiding over us.

Mr. FRANC S. BRERETON: With your permission, I should like to make a few remarks, and I propose to confine myself as much as possible to opinions and statements made in the first page of Captain Colomb's very admirable paper—opinions and statements which I think go to the root of Federation. I think there are two well-known facts—facts which are generally admitted that it would be well to bear in mind: one is the military fact, that the strength of a fortress is but equal to its weakest part; the second might be called the maternal fact, for few mothers can believe that their child has become a bearded man and is free from their control. Captain Colomb says the main features of Imperial Federation are the unity of Empire and the development necessary to preserve it. The first he goes on to say is based on the present and universal acceptance of the declaration that it is to the mutual material advantage of all parts of the Empire to be united. I should like to have added a word or two to that and said it ought to be, because I am afraid we shall have presently to consider as to whether the present connection between the mother country and her Colonies is to the mutual material advantage of all parts of the Empire. The statement raises the question as to what are the mutual material advantages at the present time. Colonel Colomb says that Imperial Federation has to do with facts commercial, political, naval, and military. Let us take the first. The facts commercial—what are they? As for the mother country, her mutual advantages I do not question, and therefore I won't say more of that. I believe she has enormous advantages. But how is it with the Colonies; what are their commercial advantages? Have they any more advantages now than if they were severed? Have they any more advantages than an ordinary foreign country? Have they any more advantages than the United States of America? I apprehend they have none. I apprehend if you go to our Colonial cousins and ask them, they will tell you they have none; they will tell you that practically they are foreign nations; that if they were severed to-morrow, so far as their commerce goes, they would be able to deal with England on exactly the same terms, that is, on the most-favoured-nation terms; they have nothing better than that. They will tell you the mother country is constantly entering into commercial treaties with foreign nations, by which she binds herself not to give her children better terms than she does foreigners; that at the present moment she is about to close a treaty of the same kind with Spain, but slightly different from former ones, because I believe, as a rule, in former treaties we had the power of closing them at the end of the year by a year's notice, but this treaty is to be for six years; to bind us to a state of things of that kind is not wise. I think our Colonial friends may well say England by these treaties with foreign nations is selling their birthright. Therefore I hold that, so far as commerce goes, our Colonies actually have no advantage.

The next question is political: I think that has been answered already. A gentleman has told you here that the Colonies are liable to defend themselves in case of war, and yet they have no word in Imperial politics. The Federation League have not told us how or in what manner they propose to federate. How that is to be done is not for a humble individual like me to suggest. I had hoped in coming here this evening we might have heard it; I had hoped the Federation League would have been able perhaps at this meeting to put before us a scheme—a scheme not put forward by the Government of England, but put forward by the League, and then probably another League might have been made in the Colonies to consider and improve that scheme, and eventually to hand it to the Government of this country to propose to the Colonial Governments. The next question is naval and military. The paper of Captain Colomb's demonstrates beyond question that so long as the Colonies belong to the mother country, Federation for defence is an actual necessity; but at the same time I am afraid our Colonial brethren might take this paper and read it as an equally strong proof why they should sever from the Empire, because it shows them the necessity of protection, against what?—a war entered into by England—a war entered into by the English Government—a war possibly caused by the want of backbone in an English Foreign Minister. Therefore I hold that this paper, admirable as it is, is also a proof to our Colonies why practically they should sever. I submit that so far as commerce, politics, and army and navy matters are concerned at the present time, the Colonies have no beneficial interest in the connection. How is it proposed to give that beneficial interest in the future? I apprehend that commerce is the main way—the only way would be by commercial treaties, which would be beneficial to our Colonies. That would recognize our Colonies as being our children, which would enable them to trade with us upon terms better than the most favoured nation, better than foreigners, better than Russians, Germans, French¹. But a one-sided policy of free trade stands in your way; the question is, Federation of the Empire on the one side, free trade on the other. History tells us that nations are like men; they have childhood, youth, manhood, their prime, and old age and decay. Is England in her old age? Is she on the verge of decay? or is she only a child that has barely learnt to walk and has yet to run? I submit, with all deference, that it depends upon the two questions—will you have Federation and renewed national life, or will you have one-sided free trade and senile decay? You cannot have both; because if you do, then the foundations of your Empire will be only laid upon the quicksand of sentiment instead of upon the rock of mutual advantages. At the present time the questions of free trade and confederation have been before the country; how fares it with both? Five or six years ago I do not suppose you would have found a hundred men who would have dared to have said a word against that great one-sided free trade: if a man did, it was with bated breath. But what is it now? There is a powerful league called the Fair Trade League. Go right and left all over the country, and you will hear the word in all men's mouths. Go in amongst our working classes and what will they say—"A one-sided free trade has taken the bread out of our mouths." When we speak to the man and say, "Look at the loaf you have—it only costs 4d." "What matters that, sir, I have no labour—no work; I have not a penny to buy it with; I would sooner pay 6d. for the loaf and have employment all day." Those views and opinions are spreading all over the land. I am not going to do more than call attention to the question at issue before the country, and to say that, so far as I am capable of judging, one-sided free trade has had its death-blow, and a few years hence it will be a thing of the past. With regard to Federation, five years ago it was hardly heard of; now, wherever you go you hear of it. It might be said that five or six years ago the bar of iron out of which it is proposed to forge the Fede-

¹ The United States of America receive from the United Kingdom of Great Britain and Ireland over 50,000,000*l.* per annum for food products, which by commercial treaties with our Colonies on protective duties on products from foreign countries, might be transferred to our Colonies, and thereby a great material advantage given to them.

ration of the Empire was laid before the furnace of public opinion. At one time it got a little hot, and the next it got cold. A kick would send it into the furnace, or, on the contrary, send it in the other direction. About a year and a half ago that kick came, practically caused by a whisper—an electric whisper—what might almost be described as a stage whisper, that grew in magnitude as it travelled—a message that left the Antipodes as a whisper and arrived in England as a shout, which proclaimed that the Colonies were prepared to join England in protecting herself. That kicked the bar into the fire, and there it is; able and willing men have their hands at the bellows. These papers that we have heard are a proof not only of their ability, but of their power and increasing energy. Are you willing to lend a hand? Are you willing, when the iron is hot, to forge it? Are you willing to put your shoulder to the wheel and drive out that one-sided free trade which stands in the way of Federation, and are you prepared to create in its stead a rock of mutual beneficial advantage, which would lay the foundations of a great Federated Empire?—an Empire whose strength would be sufficient to secure peace and prosperity for its people, and an Empire which in years to come would grow into a power which even the most sanguine of men have never dreamt of.

Captain CERTIS, R.N.: Sir Charles Nugent has said that the British imports exceed the exports by 187 millions; this surplus is explained by the English capital invested abroad; the country is paid in freight and merchandize. History also teaches us that countries do not live alone by a carrying trade, manufactures, or commerce: they should be, as nearly as possible, self-supporting, such as America, for instance. I do not know whether there are many landed proprietors here, but those that have their lands going out of cultivation would no doubt like to see fair trade, a certain protection put on wheat so that it should not be less than 40s. a quarter. No one could grumble at that. Of course the bakers and butchers, not the consumers, get the benefit of the present low prices. We have heard of the herring curer who wrote to Sir Robert Peel to say he was a free trader in everything but his own commodity, viz., cured herrings, and it is so with every one. In the case of foreign countries which have no money invested abroad, their exports pretty well balance each other. I was at a discussion at the Colinderies the other day about the emigration of children. We are all indebted to Miss Fry, Dr. Barnardo, and others, who interest themselves in sending out these poor children. The Colonists say: "Send us children with good characters." I should say, let the Colonies have groups, that is families.¹ Moreover, every man who leaves this country, whom the unions have driven abroad, competes with the mother country. In this country a man who can and will work has his labour limited. He should have what he can earn. Rome fell when she began to import her corn from abroad and allowed her own land to go out of cultivation. In our own time Italy is draining the Pontine Marshes. In England if you go into rural districts it is distressing to see the decrease of population; men flocking to the towns, and many becoming paupers. They sell all their goods and come up to town and pay 5s. or 6s. for a room, whereas in the country for 1s. or 1s. 6d. a week, they have a good cottage and garden and wholesome air.

Colonel ANDREWS, R.H.A.: Sir Charles Nugent in his preliminary remarks alluded to possible jealousies that must not be allowed to obstruct the question of Imperial Federation, but he would doubtless agree with the proposition: that it would be desirable to remove any *reasonable* cause of jealousy on the part of either the mother country or a dependency. One such cause exists in the present depreciated and unstable value of silver, whereby a most unfair protective advantage is conferred upon some Colonies and our great possession of India, at the expense of our own home manufacturers and corn growers; and as commercial interests have a strong bearing on the subject, it may not be considered out of place in any dis-

¹ It is desirable that families should emigrate direct from the rural districts and not flood the towns. Some arrangement between the governing bodies and those of the Colonies might be arranged to place them where they may be self-supporting and repay any sum advanced to help them; in that way a constant touch and good feeling would be maintained with the mother country.

cussion of this question of Imperial Federation to urge that steps should be taken by Parliamentary inquiry towards re-establishing the stability of silver, the result of which would be to supply a much-needed stimulus to our home manufacturers by relieving them and our agricultural classes from a source of *unfair* competition, dependent not on the cheaper and better producing powers of the dependency, but on the fluctuating and depreciated value of coin.

Admiral the Hon. E. R. FREMANTLE: I am not inclined to contravene or dispute the statements that have been made by the last two speakers. I think it would be a pity if we should allow this discussion to diverge into questions such as free trade and protection, or the depreciation of silver, however important they may be of themselves. I think our friend who spoke so ably with respect to the advantages which the mother country gets from her Colonies and the lack of advantages which the Colonies get from the mother country, rather overlooked one or two points which are to be made in favour of the present connection. He compared the Colonies to the United States, and he seemed to overlook altogether the fact that the United States has very large independent establishments and is obliged to maintain a large diplomatic service, and also a considerable establishment of ships, and to spend a considerable amount of money for the protection of its trades. All that is done extremely efficiently for the Colonies by the mother country. I am not speaking now of the naval part of the protection, but in so far as the diplomatic part is concerned, I think that is well done, and I hope it is efficiently done by the representatives of Her Majesty in foreign parts of the world. If the Colonies were to separate from England they would have to do that for themselves, and to undertake a considerable expense. I think that is a question which has been to a certain extent overlooked. We have been told this is a question of Imperial policy, and undoubtedly a question of Imperial policy is one which is not likely to be overlooked by the Colonies. I was inclined to say that one quotation made in the extremely able lecture which we had the pleasure of listening to from Sir Charles Nugent might be read in two ways, when he says, "climates, not men's minds, by travelling vary." I think we might to a great extent dispute that. It has been made an accusation against a great number of people who live in this country that they do not travel, and that they do not understand in what Great Britain's Empire consists,—in fact that we are too parochial in our tendencies. Now I think that those who belong to the Colonies have a very clear idea that this great country is a great Empire. I think even those people in this country who go through the Suez Canal, and make possibly a holiday trip to Australia, come back with very enlarged notions of the greatness of this great Empire, and therefore I am inclined to say that that quotation made by Sir Charles Nugent may certainly be read in both ways, and I think our conceptions of this great Empire are enlarged very considerably by travelling. On the question of Imperial Federation I am quite sure that all those who were present at Captain Colomb's lecture, and those present to day, must be convinced that that is a necessity. I do not think we here have any "craven fear of being great," and I do not think we need consult any other countries as to whether we confederate for our own advantages or not. The question which has interested me is that I think some attempt should be made towards finding a practical solution of this great difficulty—how confederation is to be effected. I listened carefully to Captain Colomb's able lecture, and as far as I recollect the only thing he said on that point was that he thought that if some of our statesmen and some from the Colonies sat round a table, they would find a reasonable scheme. It was a very easy thing to say. No doubt there was a great deal of truth in it, but at the same time that does not advance us very far, and I think we have not advanced very much further to-day. We have been informed of the commercial difficulty, and that unquestionably is a very great one. I do not wish anyone to suppose that I underrate that difficulty; on the contrary I rate it so very highly that, having said that, I shall proceed to avoid it altogether for the present, because my wish is if possible to give some intimation as to how some attempts might be made towards the commencement of Federation. There are very few of us here present who have not read something at least of that charming book written by Mr. Froude,—"*Oceana*"—and we know very well that he thinks that some sort of Federation might be com-

menced through the Navy. On his arrival at Adelaide he is shown a little ship which his Colonial friends point out as their naval defence. He thinks that is very poor work,—it is only a little painted toy, it may look very smart but is no use for modern warfare,—and he says they would do much better to pay their money and to subscribe towards the maintenance of our Imperial Navy. I am obliged to digress into these particulars because there is a great point in that. Mr. Froude thinks it is simply a question of paying the money. I am quite aware the Admiralty would give us another version of that,—that this great desire to be joined to the Imperial Navy and to see the same flag, the flag of England, waving over the ships which they have assisted to pay for,—that this is a very natural, a very proper and very Imperial desire, but I think the Admiralty would say, and I believe truly, that the Colonists will wish to see something for their money. That is what the Admiralty will say,—when they subscribe in this way 50,000*l.* or 100,000*l.* a year, they will want to see their 100,000*l.* There will be certain people, whether from Adelaide, Melbourne or Sydney, who will say, “We have paid 100,000*l.* towards the Imperial Navy, where are the ships?” “They are protecting British interests in the Fijis and other places.” “Oh, but the Fijis do not pay for them.” I think that is the practical difficulty. Now I wish to explain how that may be got over. It appears to me it would be quite possible for ships which are intended to be used in our various Colonies to be practically paid for by the Colonies, that is to say, those ships that are for harbour use. Assume for the same argument that that little squadron which we have now at Melbourne, commanded by a Post Captain in the Navy, and which consists of one ironclad and a couple of gunboats, and a few torpedo-boats, if that were considered the harbour defence of that Colony, the ships not to be moved away except by permission of the Colonial Government, but that they were to all intents and purposes Imperial ships, the Admiralty manning them and appointing the Officers to command this Colonial branch of the Imperial Navy, it seems to me that would meet our difficulties to a very great extent. They would then have the benefit of the Imperial Admiralty superintendence, they would have Imperial Officers, the Imperial flag, the Imperial discipline, and that nevertheless the Colony would see something for its money. Of course these vessels not being used for the South Seas, and not being as a general rule taken away from their Colonies, I can quite understand we should still have to pay for the ocean service as it were, but that is a matter of detail subsequently. It might be arranged that in addition to that the Colonies should be good enough to make a grant towards the Imperial Navy which was going to the South Seas. It seems to me some course such as that might be adopted, and that so we should obviate the difficulty which would naturally arise. The question of the flag is an extremely important one. We often talk sentimentally and we often talk figuratively of one flag. It means a great deal, and the one flag is one thing which the Colonists would like to see flying over the men-of-war which come to their ports. I wish distinctly to convey that that is the whole point of what I propose now, it is that the flag should be flown over ships manned from the Imperial Navy acting under the orders of the Admiral on the station, but with an understanding that they should not be moved away from that Colony without the assent of the Colonial authorities. I look forward then to that one flag being something which would be making a start, and that start would be made by the Imperial Navy. I refer once more to “Oceana,” and recollect how Mr. Froude tells us that the success of our Colonial Empire is due to the Navy, and if I have spoken at greater length than I intended with reference to detail, it is because I think detail has not been sufficiently considered. I propose then to begin with one flag, and under one flag we should have one policy and one Empire.

The CHAIRMAN: Gentlemen, I see the warning hand of the clock, and those who are accustomed to these discussions tell us that we must bring these proceedings, interesting as they are, to a close. Before doing so perhaps I shall have leave to make a very few remarks, and first of all let me say how sure I am that the heartiest thanks of this meeting will be given to Sir Charles Nugent for the extremely able and interesting paper which he has read to us. As to the question before us to-day, we are carrying on an adjourned discussion upon Captain Colomb's paper, which we are, so to speak, interweaving with the subjects which

arise under Sir Charles Nugent's paper, and those two papers together form, as it seems to me, a very homogeneous and complete subject-matter for consideration. The discussion this afternoon has, perhaps, ranged rather more over the political and commercial side of the question than over the military, but in this theatre it must never be forgotten how very much a part of this matter the naval and military consideration must be. I would venture to put before this meeting as clearly as I can that there are two aspects to be considered—first of all the naval and military aspect, and, secondly, the question of Federation itself as connected with that naval and military aspect. Let me say a very few words on the first of those. I would urge that the naval and military aspect is at the present day one of vital importance. Sir Charles Nugent touched upon it with reference to that gravest of all questions, our food supply from over the sea, the diminishing power of this country to keep its population in time of war, the incalculably enormous value of the carrying trade to us in a commercial aspect, and the risks that that carrying trade would be exposed to in time of war. He did not, however, dwell upon one other point which must never be lost sight of—the wasteful and ruinous character of naval and military scares at times when war is supposed to be threatening. Gentlemen, I have had, I am sorry to say, some experience of what those scares are, and I wish that any words of mine could convey to the country not only the gross impolicy of leaving matters alone up to the point when it becomes necessary to improvise fortifications and to devise military and naval expedients at the last moment under pressure of war, but also the rumous character of those expedients when they are devised—money often thrown away, and even worse, because at the conclusion of the whole matter things are left in a position in which statesmen and Governments are tempted to rely upon these temporary expedients that have been devised until a fresh and perhaps still greater danger arises. Now, during the last year and a half or two years something has been done in the way of military fortification in our distant stations. I am quite aware that a considerable amount of money is being spent at Hong Kong and Singapore, but when credit is taken for that, let me remind this meeting that it is done almost entirely at the present moment at the expense of the Colonies themselves. England has, as far as I know, contributed extremely little to that outlay. We shall of course provide the armaments, but as far as I know the armaments are not in position, and the greater portion of the expense is being incurred by the Colonies themselves. Precisely the same thing may be said of two great and responsible and self-governing Colonies, Victoria and New South Wales. There, by the vigour and energy of those noble Colonies, very great and useful works are being undertaken, not one hour too soon, and a large sum of money has already been expended; but that has been entirely and solely at the expense of the Colonies, and, as far as I know, we have not subscribed one shilling towards it. I do not complain of that; it is right. If I had time to argue it, I should say that the Colonies are wise in spending that money on their self-defence; but, on the other hand, that we are bound also to give them all the assistance of our fleet in that part of the world. I might go further and say, if time allowed, how much remains of almost vital consequence which is left undefended both at home and abroad. I will not touch upon the home question, but I do say with the deepest sorrow that in spite of everything that has been urged by those who are familiar with this subject, the Cape still remains absolutely unfortified. Now, if there is any one single outpost of the British Empire in which the defence of our enormous Colonies is wrapped up, it is the Cape of Good Hope. The Suez Canal is doubtless of very great importance, but I believe there are many who will agree with me that enormous as the value of the Suez Canal is, the importance of the Cape is at least equal to it. For that nothing whatever has been done in spite of argument and earnest appeal. It is not that this Institute has to be blamed in that respect, for within these walls the voices of most eminent Officers have been lifted up on this subject; it is not the fault of the military or the naval profession, they have spoken out in no doubtful terms, it is not the fault of the press, they have exposed our dangers and difficulties over and over again. Nor can I take the blame to myself, for having been Chairman of the Defence Commission abroad,

and having sat on that for three years, together with some most able colleagues, and having expended an enormous amount of time and trouble over the subject, I have been compelled in the name of that Commission to protest against the negligence that was bringing this Empire into extreme danger. But the constitution of Government, of Parliament, and of public opinion is such that great questions are put aside for little ones, subjects of merely passing and ephemeral interest are allowed to usurp attention; there is a terror of spending 1,000*l.* now, when 100,000*l.* may be required a few months afterwards to redeem it, and above all there is a total absence of that continuity of policy without which the stability of Government cannot be insured. Well, that is the military and the naval aspect of the matter stated very shortly; now, let me say a few words on the second branch of the question, Federation, and how far that is interwoven, so to say, with military and naval considerations. I can assume the truth of what has been urged here this afternoon of the many and varied difficulties which beset this question. Admiral Fremantle said that he had hoped that a complete and actual scheme of Federation would have been laid before us. Gentlemen, I have heard this subject too long and too often discussed to indulge the hope that any actual scheme can be laid before us in a few hours' discussion; it is full of difficulties, and those difficulties are alike theoretical and practical. But I will venture to lay down three or four propositions: the first is this, that in my conscience I now believe the time has come when the bonds of England and her Colonies may be drawn much closer and tighter, but what this closeness should be in the way of political constitution I do not at this moment undertake to say. It would require a long time to define it or to approach it, but I say the time has come when those bonds should be more closely drawn. And in the next place I do not believe that there is any real or practical obstacle in the way. It was but a few weeks since that I was talking to a man of great Colonial authority and experience, Sir Alexander Stewart. It was, perhaps, the last political conversation in which he engaged, and I, without breaking any of the confidences of private talk, may at least say this much, that I think he agreed with me in believing, as I said, that the time had come for Federation, but that it was necessary to approach it by degrees and cautiously, that we must not in fact hope to devise at once a scheme that would provide for every condition and requirement, and that we must be prepared to go on tentatively step by step winning our way by solid, but at the same time by very gradual progress. And, thirdly, I will lay down this, that the complete defence of your coaling stations and your outposts abroad has, in the altered conditions of modern warfare, become absolutely essential for your Colonial no less than for your English commerce. Gentlemen, the conditions of war have greatly changed. Strangely enough, the conditions of attack and defence have been moving almost in parallel lines, and as one has advanced a little ahead of the other, so the other has in turn taken the lead. In one respect it may be described as favourable, and in another respect as unfavourable to us. But the one single condition which never can be lost sight of is that steam, and that which engenders steam, the supply of coal, has become the main factor in the commercial, political, military, and naval sum with which you have to deal, and unless those stations are adequately defended, there is no security for Colonial commerce any more than there is for English. But that can be done. The Commission of which I was Chairman proved that it could be done effectively, and at the same time at a moderate expense. And, fourthly, I would say that the feeling for a closer connection in these respects is one growing in the Colonies quite as much as it is in England, and I can speak on these points from the experience unfortunately now of a good many years. My whole public life has been, so to speak, colonially trained. When I went into the Colonial Office, as I think my friend Sir Charles Nugent has been kind enough to recall, as an Under-Secretary in 1858, I remember well what the feeling was then. I think indeed as Under-Secretary for the Colonial Office it was my business in those days to lay before the late Lord Derby the estimate for the first Colonial man-of-war that was ever sent out, I believe, the "Cerberus" at Melbourne. At all events, I remember well what the feeling was in 1858; I remember that what is now considered as commonplace could not then have been said. I remember again the state of feeling as to

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the relations of the Colonies and the mother country when I was Secretary of State in 1867-68, and I remember noticing how great the advance had been. I remember again in 1874, during the time I held office as Colonial Minister, how many things it was possible to propose and to do which ten years earlier would have been impracticable. And, lastly, I remember what the feeling was as shown to me, and to the Commission of which I was Chairman from 1879 to 1882, and again how great the move in public feeling was. When my mind travels back over those four successive stages of Colonial experience I can only sum it up in this, that there has been an enormous advance of Colonial feeling in the direction which I have indicated, as indeed there has been in England on the same subject. And now, fifthly and lastly, I would say, that viewing as I do this Imperial Federation as the object to be secured, but perhaps not to be secured at once by any one Colonial chart or scheme complete in all its parts, but rather to be won by discussion and argument and step by step, I believe that there is no one measure which more directly tends to the object we have in view than that of military and naval defence. Military and naval defence seems to me at this moment the keystone of Imperial Federation, and those who desire, as I do from the bottom of my heart, Imperial Federation, will keep their eyes steadily fixed upon that question of military and naval defence, because sure I am that that is the first, the most obvious, and the most expedient step to take in that direction. I say the most obvious and the most direct because the objections to it are none at all, the advantages of it are manifold, visible, almost tangible, and it is free from many of the complications which come in in so many other aspects of this large and grave question. Admiral Fremantle touched in this respect on one very interesting point—the different terms upon which we should enter into partnership, so to say, with some of those great Colonies in naval matters. I should take up a great deal too much of your time if I were even to argue that one single point. I will only say I have often and often considered it, and although I fully admit that there is the difficulty that these Colonists who have paid for their ships might be dissatisfied if they saw those ships taken away to a distant part of the Empire, still I do not look upon the difficulty as at all insuperable. I believe it can be overcome, and I would even say on that one particular point that it must be remembered that it often happens that the fortune of a war is debated, not on the particular point of the frontier on which the inhabitants would desire the battle to take place, but it may be fought 100 miles or even 500 miles distant; that in fact the fortunes of New South Wales might be decided at the Fiji Islands in time of war. That is a self-evident proposition, and no military or naval man would for a moment think of disputing it. It might be that the great battle of the campaign might be fought 1,000 miles off, and possibly in that case every Australian ship not only should be there, but would desire to be there on the spot to take part in it. There are many ways in which a partnership can be carried out. It might be by the Colonists themselves providing the ships; it might be by the Colonists providing money contributions; it might be by a closer union between this country and the Colonies, such as already been begun through naval cadetships, and which I hope may be carried through much further; and generally, I may say, I subscribe to what Admiral Fremantle has said, in desiring to see the Colonial and English Navy identified, living, sailing, fighting under one and the same flag. As regards the military side of the question, I believe for my own part that there are excellent materials in point of men in these great Colonies; all that they need is organization and discipline, and that organization should be, I hold, provided by the mother country; it alone can supply it. It is not to be had on the spot, and it can be supplied without any great expense or any great trouble by us. In the same way there are at this moment no adequate supplies of arms or ammunition or ordnance, and it seems to me wrong that distant Colonies should have to depend entirely upon Woolwich and Elswick in these matters. And now I have said enough on this subject; I will only close by saying this, that I believe there ought to be an understanding and co-operation with these great Colonies. An understanding I believe would prevent any serious obstacle if it be approached in the right spirit. Co-operation we have lately had ample evidence will be given by our great Colonies the moment it is needed. Both Canada and New South Wales

during the Egyptian campaign amply proved it. I, for one, therefore, believe heartily in Imperial Federation; I believe in it from its military, its political, and to a certain extent from its commercial side. I acknowledge the difficulties, but I believe that they can be overcome, and I rejoice when I see in a great and important Institution like this, which naturally exercises great weight, to listen to the opinions that we have heard which have been expressed in no faltering terms, and with no uncertain sound.

Admiral Right Hon. Sir J. D. HAY, Bart.: I hope the meeting will allow me to propose that we offer our thanks to Lord Carnarvon for having presided over us. We have been very fortunate to-day not only in the lecturer, but in the Chairman. The words they have spoken I think will do much to cement the union between the Colonies and the mother country if that be needed, and also to carry forward the great work of Imperial Federation which we all desire.

Admiral Sir E. FANSHAWE: I beg leave to second the resolution. We have always felt it to be of great advantage to this Institution when, on the occasion of an important lecture, such as the one of this afternoon, we are favoured with the presence of an eminent statesman in the chair, and we feel this most emphatically upon this occasion. We have to thank Lord Carnarvon not only for taking the chair and regulating our proceedings, but also for giving us a most interesting historical description of the progress of the Federation question with the Colonies in its most important aspect—namely, the military and naval defence of the British Empire. I am sure the discussion of this afternoon will be received with the greatest interest by the two professions which this Institution represents.

The CHAIRMAN: I am very much obliged to you for the compliment that has just been paid to me. It has been a matter of great interest to me to be present this afternoon.

Wednesday, June 16, 1886.

LIEUT.-GENERAL SIR ARCHIBALD ALISON, BART., K.C.B., &c., &c.,
in the Chair.

THE NEW MILITARY RIFLE AND ITS COMPARISON WITH OTHER MILITARY RIFLES, ENGLISH AND FOREIGN.

By Colonel H. T. ARBUTHNOT, R.A., Superintendent, Royal Small-
Arms Factory, Enfield.

IN the course of the few remarks I am about to make, I propose very briefly to trace the history of rifles from their first introduction into the Service to the present day, and then to enter somewhat more fully into a description of the new Enfield-Martini rifle (table, p. 914).

The idea of rifling a barrel with the object of giving a bullet a spin or twist is no new one. Rifles were certainly in existence 250 years ago, but the first time we hear of a rifle being used as a service weapon was about the year 1800, or a year or two later, when the old 95th, now the Rifle Brigade, had rifles served out to them. The rifle with which this regiment was armed was called "Baker's Rifle," so called from the name of the inventor. There were two patterns of this arm, one with eleven grooves, and one with seven grooves. The twist of rifling was one turn in 136 in.; its weight was 8 lb. 9 oz., and length, 3 ft. 9 $\frac{3}{4}$ in., the length of the barrel being 2 ft. 6 in., and bore 0.705. The bullet was spherical; before being rammed down it was wrapped in a grease patch, there being a cavity in the butt for carrying these patches. The object of the patch was partly to lubricate the barrel, and partly to make the bullet fit tight so as to take the rifling. But it was so difficult to force the bullet home when wrapped in its patch, that a mallet was served out with each rifle so as to hammer it down. The rifle was fitted with a sword bayonet.

I cannot trace how long this rifle remained in the Service, but although it was much disliked, owing to its inaccuracy of fire, as well as on account of the extreme difficulty experienced in loading it, no steps appear to have been taken in England towards discovering a more efficient weapon; whereas on the Continent experiments were being carried out continuously. About the year 1836, however, the Brunswick rifle was introduced into the Service.

The weight of this rifle was.....	9 lb. 6½ oz.
Length	3 ft. 10 in.
Weight of barrel	3 lb. 13¾ oz.
Length „ „	2 ft. 6¼ in.
Bore	0·620 in.

Rifling, 2 grooves, 1 turn in 2 ft. 6 in.

This rifle was also fitted with a sword bayonet, weighing 2 lb. 0½ oz.

The peculiarity of this arm was that the bullet, which was spherical, was “belted;” in loading, this belt was placed in the two grooves, this method being adopted to give the bullet a spin. A grease patch was also used with this rifle, which added to the difficulty of loading by making it extremely uncertain whether the belt was properly placed in the grooves or not.

This rifle was the first arm in the English service which had a percussion lock, and it was not until the year 1842 that a percussion musket was generally adopted for the Service.

The Brunswick rifle remained in the Service until 1851, when it was superseded by the Minié, which had some time previously been introduced into the French Army. Up to this time rifles were only issued to rifle regiments, but with the introduction of the Minié rifle it was intended to arm the whole Army with rifles.

The adoption of this rifle was a great step in advance; it was the first time the spherical bullet was discarded, and in its place was adopted one of a cylindro-conoidal form; the bullet had a hollow base, in which was placed an iron cup; on the explosion of the powder this cup forced the bullet into the grooves of the rifling; the grease patch was also discontinued with the adoption of the Minié rifle, lubrication being obtained by greasing the paper in which the bullet was wrapped with a mixture of tallow and beeswax. Some of the regiments in the Crimea were armed with this rifle, but it was cumbersome and heavy, and as early as 1852 experiments were made by order of the Master-General of the Ordnance, Lord Hardinge, with a view of obtaining a better weapon. The result of these experiments led to the introduction of the Enfield rifle, pattern 1853. The chief feature in this rifle was the large reduction made in the diameter of the bore of the barrel, viz., from 0·702 in. to 0·577 in. This reduction of the bore enabled the barrel to be made very considerably lighter without in any way impairing the efficiency of the arm as a shooting weapon; in fact it shot very much better, as the bullet was better proportioned. This was the first arm in which the bayonet was secured to the barrel by a locking ring.

There were two patterns of Enfield rifle, the long rifle for the infantry of the line generally, and the short rifle for rifle regiments and sergeants.

With the introduction of this arm also was the first commencement of manufacturing arms on the interchangeable principle.

The Enfield rifle continued to give perfect satisfaction until the Danish war of 1864 called attention to the very vast superiority of breech-loaders over muzzle-loaders. The Prussian Army had indeed

been armed with a breech-loader, the old needle gun, or "zundnadel-gewehr," for very many years; but it was not till the Danish war that its superiority was manifested. There was immediately an outcry in England for our Army to be armed with breech-loaders, and it was determined, before waiting for an entirely new pattern of arm, to endeavour to convert the large store of existing Enfield rifles into breech-loaders. Experiments were made which shortly led to the introduction of the Snider rifle.

By the adoption of the Snider breech action, the old arms were readily converted, and new arms on this principle were also made in large numbers, so that by the time of the Franco-Prussian war, the whole Army was armed with breech-loaders, and during the winter of 1871-72 the Volunteers and Militia also received these arms. But it was perfectly well understood that the introduction of the Snider was only a makeshift; the Snider was merely intended to fill the gap until a more perfect and more efficient weapon could be devised. Trials on a very extended scale were conducted for some time, and in 1871 the Committee which had been appointed to consider the whole question reported in favour of the Martini-Henry rifle, and the same was finally approved in April of that year. Manufacture commenced shortly afterwards, and the first issue of Martini-Henry rifles to the troops was made in 1874.

This arm was vastly superior to the Enfield or Snider rifles in every respect. The diameter of the bore of the barrel was greatly reduced, viz., from 0.577 in. to 0.45 in., whereas the bullet was maintained at the same weight, and therefore being much smaller in diameter, was of necessity much longer, thus giving it far greater power of overcoming the resistance of the air; the charge of powder was greatly increased, so that the muzzle velocity was much higher. The long rifle was discontinued, and there was but one pattern of arm for all ranks.

There is but little doubt that, at the time of its introduction, the Martini-Henry was the finest military rifle in Europe. I am aware that there is much difference of opinion with regard to the merits of the Martini breech action, but although this action has now been tried in campaigns under every condition of climate and exposure, as an "action" it has never been known to fail. It is true there were many complaints of "jamming" in the Soudan, but this jamming was due more to the cartridge than to the Martini action, and had the same cartridges been used in a rifle with a "bolt" action, the jamming would have been much worse.

Before proceeding further, I should like, with your permission, to draw attention to the successive steps in advance which have been made as each pattern of arm has been introduced since the beginning of the present century. As this paper concerns rifles only, I have said nothing about smooth-bore muskets, but I may remark briefly that from the year 1800 to the year 1842, the infantry of the line, with the exception of the rifle regiments, was armed with the old "Brown Bess" of the Peninsula. It was not till the year 1842 that any alteration was made, but in that year a musket weighing 1 lb. less than the "Brown Bess," and having a percussion instead of a

flint-lock, was introduced. This musket remained the infantry weapon until the Enfield rifle was issued universally to the Army; for although it was intended that the Minié should have been the universal arm, there were never a sufficient number of this pattern of arm made for general issue.

With regard to rifles, the "Baker" rifle was a very primitive weapon, and had but few points of recommendation. The "Brunswick," which superseded it, had a percussion lock, and an endeavour was made to spin the bullet by fitting it into the grooves.

This rifle in its turn gave way to the "Minié," with a reduced bore and an elongated bullet, which was made to take the rifling by being "set up" by means of an iron cup or disc in its base.

The Enfield advanced further in this direction by greatly reducing the bore and still more lengthening the bullet. This was the last muzzle-loader. Then came the era of breech-loaders, the Snider leading the way, to be followed very shortly by the Martini-Henry, in which the principle of increasing the power of the rifle, as well as its accuracy, by diminishing the bore and increasing the length of the bullet in proportion to its diameter, was still further developed.

It was not till about the year 1879 that doubts began to be expressed with regard to the superiority of the Martini-Henry rifle over rifles in use in other countries; it was then found during some experiments which were being conducted by the Siege Operations' Committee at Lydd, that although the Martini-Henry rifle was superior to all other arms at ranges of 500 yards and upwards, it was inferior to them at ranges below 500 yards, so far as regards velocity and flatness of trajectory. The reason of this can be readily understood. In most of the foreign arms there is a greater proportion of powder to bullet than in the Martini-Henry rifle, consequently the muzzle velocity is higher, and the trajectory lower at short ranges. But the foreign bullets being lighter in proportion to their diameter than the English bullet, they have not the same power of overcoming the resistance of the air, and therefore the velocity soon falls off, and at ranges from 500 yards and upwards the Martini-Henry rifle has a higher velocity than the foreign arms. But it was considered desirable that the English Army should be armed with a rifle superior to the foreign rifle in every particular, and at all ranges, and it was for this reason that it was determined to make an endeavour to produce such an arm.

Before describing the new rifle, which is to be called officially the "Enfield-Martini," it will be as well to see in what particulars the foreign rifles were superior to the Martini-Henry, and in what particulars it would be necessary to bring up the Enfield-Martini to a superiority over the foreign arms.

I do not propose to enter into a full description of the principal arms in use in foreign countries, but I have specimens of them here from which it will be seen that the breech actions are all on the "bolt" system, with the exception of the Austrian arm, the "Werndl," which has a revolving block, and the United States arm, the "Springfield," which has a turnover block, and I have prepared

tables (pp. 912, 913), which may be of interest, giving particulars of these arms with regard to their weight, dimensions, velocities, trajectories, &c., in comparison with the Martini-Henry rifle. (Plates XXII, XXIII, XXIV). From this table it will be seen that, with the exception of the Jarmann, none of these arms have so small a bore as the Enfield-Martini rifle; but that they are all smaller than the Martini-Henry, except the Springfield, which has the same bore; they have all a higher muzzle velocity than the Martini-Henry rifle; at 500 yards the velocity of the "Mauser," the "Vetterli," and the "Werndl" is very slightly below that of the Martini-Henry; whereas, that of the "Berdan" and "Gras" is still slightly in excess of it, and the "Jarmann" still considerably in excess. At 1,000 yards the Martini-Henry is superior to the whole, except the Jarmann, which is still slightly in excess of it. At 1,500 yards the Martini-Henry beats even the Jarmann.

The highest point of the trajectory of these arms at the various ranges very nearly follows the velocities, except in the case of the Jarmann, which maintains its superiority to the end.

As regards the weight of the arms with bayonet, it will be seen that the Martini-Henry is lighter than any other arm with which it is compared, and also that, with the exception of the "Springfield," the value of $\frac{D^2}{W}$ is less.

It may be necessary, perhaps, to explain the meaning of the expression $\frac{D^2}{W}$.

This is the mathematical formula used in this country to denote the power of the air to retard bullets in their flight, where D is the diameter of the bullets in inches, and W its weight in pounds; therefore the smaller the value of $\frac{D^2}{W}$, so much less power has the air to retard the bullet; and *vice versa*, the heavier the bullet can be made in proportion to its diameter, the better able will it be to maintain its velocity at long ranges.

From what I have pointed out, it will be seen that in order to ensure the Enfield-Martini being superior *at all ranges* to the foreign arms, it was not only necessary to start with a high muzzle velocity, but to maintain it, by keeping down the value of $\frac{D^2}{W}$ to as low a figure as possible, and this was the problem set me to solve; a further reference to the table will, I think, show that the problem has been solved theoretically, and I trust that the trials now being carried out at various stations will show that it has also been solved practically. And here let me state that I wish to take no credit to myself if the rifle turns out a success; the credit is due to Major McClintock, and to others of the staff at Enfield, who so ably assisted me in working out the details of the arm.

I will now proceed to describe the Enfield-Martini rifle. (Plate XXII.) To begin with the barrel, this being the most important part of the arm.

It is very easy to obtain a high muzzle velocity, all that is necessary is a light bullet in proportion to the powder charge; but when you have to keep up a high remaining velocity the difficulty begins; then a heavy bullet becomes necessary, and with a small bore, a heavy bullet means a long bullet; then the longer the bullet, the quicker must be the twist of rifling, and the quicker the twist, the more liability there is to foul.

Before it was finally determined to recommend a barrel with a calibre of 0.40 in. for submission to the Committee, we tried barrels of various calibres between 0.45 in. and 0.35 in., always fixing the bullet at such a weight as to maintain the value of $\frac{D^2}{W}$ at about the

same figure, viz., 2.9; but I finally settled on the 0.40 in., because I found that with that barrel I got most uniform shooting; with good ammunition it never varied, whereas, when we went below 0.40 in., although we sometimes got magnificent shooting, it was not always so uniform as with the 0.40 in. Another reason for not adopting a very small bore is that a bullet with a very small longitudinal sectional area is more affected by a side wind. The twist of rifling which gave the best results was one turn in 15 in., this is a remarkably quick twist, and for some time we experienced great difficulty in overcoming the fouling; we tried wads of every description, till at length we hit upon the wad which has since been adopted. It is a compound wad $\frac{1}{4}$ in. thick, consisting of $\frac{1}{8}$ in. of hard cardboard next the powder and $\frac{1}{8}$ in. of beeswax next the bullet. On the explosion of the powder taking place, the beeswax is flattened between the cardboard and bullet and then forced into the grooves; and the cardboard being "set up," also takes the rifling and cleans out the fouling. The barrel, therefore, as finally adopted has a bore of 0.40 in. or more, strictly speaking 0.402 in., the rifling has seven grooves with a twist of one turn in 15 in.

I come now to the sighting. As the rifle has a very flat trajectory at ranges up to 400 yards, as you will see by the diagram, it was considered desirable to have two fixed sights which should cover the whole ground up to 400 yards, so that at what may be called the fighting range the soldier will not have to fumble at his backsight. The point blank of the rifle has been fixed at 100 yards, and the small sight at the breech end of the barrel is true for that range, but firing with that sight and aiming at a spot about 5 ft. from the ground the bullet will travel 350 yards before striking the ground. As, however, for the last 50 yards of its flight it would be so near the ground as not to stop a man, it was determined to fit a leaf sight also at the breech end of the barrel, which when put up should be true for 300 yards; firing with this sight up, the bullet would travel 450 yards before striking the ground, so that by using one of these two fixed sights the whole ground is covered up to 450 yards. I may state in passing that the form of the V's and the form of the front sight was determined by the Committee; it is one of the points on which Commanding Officers are requested to report, and there will be no difficulty

whatever in altering them should the form as sent out on the trial rifles not be liked.

The elevating backsight is graduated for ranges from 400 to 2,000 yards. There is a wind-gauge attached to the slide. I am aware that some gentlemen would prefer to see a sight somewhat similar to that on a Springfield rifle lately obtained by this Institution. With regard to the V's, as I said, any form can be adopted, but with regard to the wind-gauge worked by a very small screw, the mechanism is too delicate to withstand the rough usage which a Service rifle must at times be subject to. And I wish it to be distinctly understood that this rifle is not meant as a Wimbledon match rifle, but as a strong, serviceable soldiers' weapon, and, at the same time, one which shoots with perfect accuracy.

I come next to the action. The action remains on the Martini principle by the express orders of the Secretary of State. It is not therefore for me to discuss whether a better action or not could have been devised, but in view of the possibility of the introduction of a magazine rifle, which would necessitate an entirely new action, I certainly think it is better to adhere to an action which is known to be serviceable rather than to embark on endless experiments which would all be thrown away if it were eventually decided to adopt a magazine arm. The only alterations made in the breech action of this rifle are the addition of a safety bolt which acts in the form of a screw and lever, lifting the nose of the tumbler clear of the trigger; and the adoption of a round tumbler axis instead of a square one. This is done because it is found that the square tumbler axis and hole are apt to wear, when the rifle becomes dangerous, whereas with the round axis there can be no wear; but with the round axis it is impossible to have an indicator as in the Martini-Henry arm, but the Committee did not consider this of vital importance. Some alterations have been made in the stocking of the rifle, which are thought to be improvements. The butt is made narrower so as to rest better in the shoulder, and with the view of meeting an objection so often raised, "that the stock of the Martini-Henry rifle is too straight," the angle of inclination of the butt plate to the line of sight has been made more acute, so that when the rifle is brought up to the shoulder the tendency is to keep the muzzle down.

I may remark here that it is a well-established fact that English guns of all descriptions are, and always have been, straighter in the stock than any foreign guns, and I presume the straight stock of the military firearm was adopted from the pattern in general use with fowling pieces—the bend of the stock has never been altered. In all changes of pattern, from the early days of "Brown Bess" up to the present time, the bend of the stock has remained unchanged, and it is only in quite recent years that an idea has sprung up that it is too straight. Without altering the bend we have endeavoured to arrive at the same result as would be obtained by a less straight stock, by setting on the butt plate at a more acute angle. A change also has been made in the form of the fore-end. In all military firearms up to the present time, the fore-end has been grooved out so that the barrel

should lie in it; the thin shell of wood which came up on either side of the barrel gave no additional support to it, and that form of fore-end had the disadvantage of holding water, so that the barrel was constantly being rusted on its underneath side. In the new rifle the groove in which the barrel rested has been cut away, and the barrel now lies *on* the fore-end, so that it can easily be kept free from rust. A wooden hand-guard has been added to the rifle, so that after rapid firing the soldier will still be able to grasp his rifle without burning his hand. We do not lay claim at Enfield for any originality in the idea of a wooden hand-guard, as several patterns have been brought forward from time to time. Mr. Westley Richards patented a wooden hand-guard as long ago as the year 1870. Colonel Morley, now commanding the 63rd Regimental District, brought the matter forward some years ago, and although he was not successful in getting it introduced into the Service at that time, nevertheless to him is due the credit of first bringing the idea prominently to the front.

I will now say a few words with respect to the quick-loader (Plate XXII), which it is proposed to serve out with each rifle.

This, as its name denotes, is simply a contrivance designed with the object of assisting the soldier to load quickly, especially in the dark, or in wet or cold weather. It is not intended to take the place of a magazine, but is so contrived as to present a cartridge in the readiest position for a man to load. It hangs on the side of the body of the action, and holds six cartridges. The cartridges are acted upon by a zig-zag spring, which forces each one in succession up an inclined plane, the head of the cartridge being forced through an aperture in the lid ready for the soldier to take hold of when he wants to load. When these quick-loaders were issued for trial it was found that in loading from the quicker-loader six rounds could be fired in about twenty-five seconds, whereas in loading from the pouch it took over forty seconds to fire the same number of rounds.

Having described the principal parts of the rifle somewhat in detail, I will now turn to the ammunition. The cartridge case is solid-drawn, and contains 85 grains of powder; the wad, as I have already mentioned, is a compound wad of cardboard and beeswax, the bullet weighs 384 grains.

With this cartridge the arm has a muzzle velocity of 1,570 ft. per second, which is higher than that of any other military rifle, and the remaining velocities at all ranges are higher also than those of any other arm. The penetrative power of the arm is sufficient to take the bullet through a quarter-inch iron plate at 200 yards; the arm shoots with great accuracy as the diagram will show.

By the adoption of this arm and ammunition a very great simplification will be effected, because instead of having four different patterns of cartridges as at present, viz., the solid-drawn Martini-Henry cartridge for rifles, the coiled case for rifles, the carbine cartridge, and the machine-gun cartridge, there will in future be but one cartridge for rifle, carbine, or rifle-calibre machine-guns.

I now come to the last part of my subject, viz., the bayonet. (Plate

XXIII.) There has been a good deal of discussion lately on the subject of bayonets, as you are no doubt aware, and therefore more than usual interest is attached to this subject at the present time. If we again go back to the beginning of the century, you will observe that there were then two kinds of bayonets, viz., a triangular bayonet for the muskets, and a sword bayonet for the rifles. There was very little alteration in the pattern of the triangular bayonet between the years 1800 and 1853; it had a short blade, and a heavy one in proportion to its length. But when the Enfield rifle was introduced, an effort was made to reduce the weight carried by the soldier; the rifle was considerably lighter than the old smooth-bore musket, and the bayonet introduced at that time was also lighter than that in use previously. The Enfield rifle bayonet had a blade 18 in. long, and it weighed 14 oz. On the introduction of the Martini-Henry rifle it was "bushed" to fit the reduced size of the barrel, and thus continued in the Service till the introduction of the bayonet of the present pattern; indeed, it may be said to be still in the Service, for there are even now some regiments in India which have still got this bayonet. It was always supposed that it was a good weapon, but although it may have been used on a few isolated occasions, it was never put to a very severe test until the campaign in the Soudan in 1884. Two regiments, the 1st Battalion York and Lancaster Regiment and the 2nd Battalion Royal Irish Fusiliers, in that campaign had come from India and brought with them the old Snider bayonets with which they were still armed. At the battle of El Teh the York and Lancaster Regiment used their bayonets freely, and they were then found to be miserably soft, and this led to the outcry against the whole of the bayonets. But although the Snider bayonet was still in partial use, it had been superseded in 1876 by the Martini-Henry long triangular bayonet. As at the time of its introduction lightness was still considered of paramount importance, the new bayonet only weighed half an ounce heavier than the old one, viz., $14\frac{1}{2}$ oz., but was $4\frac{1}{2}$ in. longer. There can be no doubt that it was too light in proportion to its length, but nevertheless it was a good weapon, and far superior both as to quality of metal as well as in manufacture to the old bayonet which it superseded. But in consequence of the experience gained in the Soudan, it was considered desirable to strengthen the bayonet if possible. More care was paid to the manufacture, a little more metal was put into the blades, and a more severe test was instituted. I have brought these tests here to-day that you may see the difference between the old and the new test, and that you may judge for yourselves as to the quality of the bayonets now in the hands of the troops. But on the introduction of the Enfield-Martini rifle, the question of the pattern of bayonet to be issued with it had to be considered, and it was decided to discontinue the use of the triangular bayonet which was of use for thrusting purposes only, and to issue in its place a short sword-bayonet, which could be used not only for thrusting, but which, when separate from the rifle, should be a useful and serviceable weapon. This sword-bayonet is a decided improvement on all sword-bayonets which have previously been in use; it has a very sharp

Military Rifles, description of arm.										Ammunition.		
Country.	System.	Weight of arm.		Length of arm.		Barrel.		Charge.		Value of D ² W.		
		Without	With	Without	With	Calibre.	Length.	Powder.	Bullet.			
Bayonet.		lb. oz.	lb. oz.	ft. in.	ft. in.	in.	in.	grs.	grs.			
Austria	Werndl.....	9 13½	11 8½	4 2	4 2	6 0½	0.433	33	77	370	3.547	
England	Martini-Henry	9 0	10 0	4 1½	4 1½	5 11½	0.45	33 ⁵ / ₁₆	85	480	2.953	
France.....	Gras	9 4	10 7½	4 3¼	4 3¼	6 0¾	0.433	32¼	80	386	3.416	
Germany	Mausier.....	10 4	11 12	4 4¾	4 4¾	6 0½	0.433	33¾	75	380	3.453	
Italy	Vetterli.....	9 9	10 14½	4 5½	4 5½	6 2	0.408	33½	62	310	3.759	
Norway and Sweden...	Jarmann	10 1½	..	4 4½	..	..	0.397	32	77	337	3.222
Russia	Berdan	9 12½	10 12¾	4 5¼	4 5¼	6 1¼	0.42	32¾	77	370	3.336	
United States.....	Springfield	9 5¼	10 1	4 3½	4 3½	5 9½	0.45	32½	70	500	2.834	
England	Enfield-Martini	9 5	10 13	4 1½	4 1½	5 11½	0.40	33 ⁵ / ₁₆	85	384	2.917	

Military Rifles—Velocities and Greatest Height of Trajectories.

Country.	System.	Velocities.					Heights of trajectories.				
		Muzzle.	500 yds.	1000 yds.	1500 yds.	2000 yds.	500 yds.	1000 yds.	1500 yds.	2000 yds.	
		f.s.	f.s.	f.s.	f.s.	f.s.	feet.	feet.	feet.	feet.	
Austria	Wernld	1439	854	620	449	328	8·252	49·41	162·6	426·0	
England	Martini-Henry	1315	869	664	508	389	8·594	47·90	147·1	357·85	
France	Gras	1489	878	643	471	348	7·769	46·6	151·8	389·9	
Germany	Mauser	1430	859	629	459	338	8·249	48·68	159·2	411·1	
Italy	Vetterli	1430	835	595	422	304	8·527	52·17	176·3	469·9	
Norway and Sweden	Jarmann	1536	908	675	504	377	7·235	42·97	137·6	348·5	
Russia	Berdan	1444	873	645	476	353	7·995	47·01	151·7	388·7	
United States	Springfield	1301	875	676	523	404	8·574	46·88	142·3	343·0	
England	Enfield-Martini	1570	947	719	553	424	6·704	39·00	122·0	298·47	

List of Rifles in the Service from 1800 to present date.

Description of arm.	Without bayonet.		Barrel.						Bayonet.			Ammunition.		Value of D ² W.
	Weight.	Length.	Weight.	Length.	Diameter of bore.	Number of grooves.	Twist of rifling.	Sighted up to yards.	Weight.	Length beyond muzzle.	Charge of powder.	Weight of bullet.	Lubricator.	
Baker	8 9	3 9 $\frac{1}{2}$	lb. oz. 3 14 $\frac{1}{2}$	ft. in. 2 6	in. .705	7	1 in 136"	..	lb. oz. 0 15	ft. in. 1 6 $\frac{3}{8}$	drs. ..	grs. ..	Grease patch. Do.	5·886
Brunswick..... Patt. 1836	9 6 $\frac{1}{2}$	3 10	3 13 $\frac{3}{4}$	2 6 $\frac{1}{2}$	.620	2	1 " 28	..	2 0 $\frac{1}{2}$	1 9 $\frac{1}{2}$	2 $\frac{1}{2}$	557		4·356
Minié..... " 1851	9 13	4 7	4 13 $\frac{1}{2}$	3 3	.703	3	1 " 64	1000	1 0 $\frac{1}{2}$	1 5 $\frac{1}{2}$	2 $\frac{1}{2}$	680	Tallow and beeswax on paper. Do.	4·356
Enfield, long ... " 1853	8 14 $\frac{1}{2}$	4 6 $\frac{1}{2}$	4 4 $\frac{1}{2}$	3 3	.577	3	1 " 78	900	0 13 $\frac{1}{2}$	1 5 $\frac{1}{2}$	2 $\frac{1}{2}$	535		4·855
" short ... " 1860	8 11 $\frac{3}{4}$	4 0 $\frac{1}{2}$	4 1 $\frac{1}{2}$	2 9	.577	5	1 " 48	1200	1 11 $\frac{1}{2}$	1 10 $\frac{3}{4}$	2 $\frac{1}{2}$	535		4·855
Snider " 1864	9 5	4 7 $\frac{3}{4}$	4 12 $\frac{1}{2}$	3 3	.577	3	1 " 78	950	0 13 $\frac{1}{2}$	1 5 $\frac{1}{2}$	70	480	3 canno-lures with wax.	2·953
Martini-Henry, Mark III, Pattern 1871.	9 0	4 1 $\frac{1}{2}$	3 5 $\frac{1}{2}$	2 9 $\frac{1}{2}$	.450	7	1 " 22	1300	1 1	1 10 $\frac{1}{2}$	85	480	Wax paper round bullet and beeswax wad.	2·917
Enfield-Martini . " 1886	9 5	4 1 $\frac{1}{2}$	3 13	2 9 $\frac{1}{2}$	.402	7	1 " 15	2000	1 8	1 6 $\frac{1}{2}$	85	384	Cardboard beeswax wad.	

point, it has a keen cutting edge, and is strong and handy and will stand a severe test.

There is one point in connection with the rifle and bayonet together to which I wish to call your attention; the bayonet is fixed to the underneath side of the rifle, instead of being on one side, as previously. When firing with fixed bayonets, the bayonet on the side has a tendency to twist the rifle to that side, which makes the shooting bad; but when it is underneath, it has a tendency to depress the muzzle, which is an advantage, and when in that position it cannot be seen by the eye when taking aim, which is a further advantage, as there is nothing to make the aim unsteady.

I have now dealt with all the principal features of the new rifle, and have shown in what way it differs from the Martini-Henry. There are other minor points of difference which I have not mentioned, as they are not of so much importance.

I know that I have dealt very imperfectly with the subject I have brought before you, but I trust that the discussion which will follow will tend to bring out any points which I may have omitted.

Colonel Sir HENRY HALFORD, Bart. : There are one or two points in the able lecture to which we have just listened upon which I should wish for a little more information. I will not enter upon the previous history of the rifle up to the time of the Martini-Henry. The first point to which I should wish to draw attention is that relating to the action of the Martini-Henry, which the lecturer describes as "the finest military rifle in Europe." If that refers simply to the rifles in use in foreign Services I am quite willing to agree to it, but to say that it was the finest military rifle known in England at the time is to my idea not quite the case; because at that time there were military rifles in use at Wimbledon, perfectly good military rifles in every respect, in outside form and strength, equal to any military rifles in the world, and yet as accurate as the best match rifles are at the present time. Again, Colonel Arbuthnot says that the Martini breech-action was thoroughly satisfactory. I am afraid that that can hardly have been the case, considering that there have been so many reports from that time to the present as to its failure in action by jamming, especially when any sand got into the cartridges. Reports have been made from time to time from India and from the Soudan, according to which the rifles failed very completely. They have been much altered since, and I quite agree with what Colonel Arbuthnot says, that it would be unwise for this country to take a different action at the present time in view of a magazine-gun being probably supplied to the Army within a period not very long distant. The next point I wish to speak upon is that of the trajectory. I have taken some pains in getting out the trajectory, and I believe Colonel Arbuthnot agrees with me that the formula as used in getting out these trajectories is one not applicable to small arms. Colonel Arbuthnot and I have argued this matter out very fully, and I understood him to agree with me that the way in which I arrived at my conclusions was practically a correct one. No doubt he will say it is a comparative matter, and that in comparing the new Enfield-Martini with foreign arms you get at a certain comparative result. That is not altogether correct, because trajectory depends not only on the initial velocity and the value of $\frac{D^2}{W}$ irrespective of shape, but very materially on the shape of the bullet,

and at 2,000 yards even to the amount of something like 8 or 10 feet. I should not have mentioned this subject had not the difference between us been so enormously great as it is. Calculating the trajectory by using the sight as a theodolite, I find a difference of 60 feet between the trajectory laid down by Colonel Arbuthnot and that which I believe to be the accurate or closely accurate trajectory. Whatever the errors are, and there are slight errors in the way in which I worked it out, those errors are all in the same direction—that is, magnifying the trajectory—as

those of Colonel Arbuthnot. Therefore I am overstating it when I say it is 229 feet for 2,000 yards, whereas Colonel Arbuthnot put it at 298, a difference of close upon 60 feet. At 500 yards the difference between us is about 6 inches, and at 1,000 yards about 4 feet. I have consulted with Mr. Bashforth, who got out the tables used by Colonel Arbuthnot, personally upon the subject, and there is no doubt the differences are due to lead being used in small arms, and to iron and steel having been the substances with which his experiments were made, and most careful experiments they were, some years ago. I have worked out the trajectory for the 10-inch gun on the same principle as these I give for small arms, and I perfectly agree in the trajectory that Mr. Bashforth's formula gives, and this proves my case, and I think I am justified in saying that where different metals are used different coefficients of resistance are required to work out the trajectories. No doubt the principles adopted are perfectly valid for use with a proper coefficient for a lead bullet of a certain shape. However, this matter does not affect the rifle, but only our knowledge of what it can do. There is a very much more important point, upon which I observe Colonel Arbuthnot does not touch, and that is the shape of the grooves. He does not tell us what shape he intends to adopt as the final pattern of groove in the rifle. The last patterns which I saw were the ratchet, but the pattern that I have been advocating all through is the segmental form, a form well known to riflemen at Wimbledon, easy to make and easy to repair, and distinctly, in dry weather, more accurate than any other form of rifling. Colonel Arbuthnot has pointed out two diagrams: the 500-yard diagram is a fairly good one, but the 1,000-yard diagram I do not call a good one, it is too much up and down. It was evidently fired on an exceedingly good day, because the lateral deviation is very small, but the up and down deviation is too great for a rifle at 1,000 yards. The difference of accuracy between the two patterns of grooving does not amount to very much in this damp climate. Last summer it came to something, but in India it comes to a very great deal. It is no use making experiments in this matter except in certain weather, that is to say, in very dry weather. The point is this, the ratchet has one deep side and rather a sharp edge; how much that edge has been taken off I do not know, but still the principle is to have a distinct edge of rifling on one side. The segmental rifling is an easy and even curve, and is sufficiently shallow to give the least possible hold to fouling, while deep enough to hold and spin the bullet. I am very anxious upon this point, as a great blunder will be made if the ratchet is adopted. I believe that a certain number of segmental rifles have been made. Practical shots of the present day will always pick a rifle with segmental rifling in preference to any other, because they know they can do better work with it in all weathers. I know that a letter was written to a leading rifle-maker in Ireland, asking his opinion as to the ratchet, and his answer was a very amusing one. He said the ratchet was his first love, but that he had soon seen reason to give that up; he then tried nearly every form of rifling known, and he had come to the solemn conclusion that the only form worth making was the segmental. That is a very strong opinion from a very practical man, and I mention it because, as he has been an opponent of my friend Mr. Metford, it is a thoroughly unbiassed opinion, and if he could have said anything honestly that would have gone the other way I think he might have done so. There is no doubt it is an entirely outside opinion free from bias by me. As for these segmental grooves, they certainly are the easiest form to cut. I have inquired of every gun-maker that I know who has been in the habit of cutting them and also of cutting other grooves, and they all with one accord tell me that they prefer the segmental to any other form of groove. In the matter of the experiments which Colonel Arbuthnot has told us he has carried out, I must confess I think the experiments which have been made by hundreds of men shooting for their own honour and profit during the last fourteen years with the military breech-loader are very much more to be depended upon than a series of experiments from machine rests carried out by foremen at any establishment, however well conducted. I am not in the least throwing any slur upon the Enfield Factory or upon the way in which it is conducted, but the experiments of the shooting men, carried out by firing in all weathers from the shoulder, are to my mind far more exhaustive than any experiments that can be conducted by one or two individuals from machine rests at one establishment.

These experiments by practical riflemen have been conducted at no cost to the Government, and have certainly produced the finest rifles in the world. Witness, for instance, the matches that we have had against the Americans with them, and the work constantly being done in this country with them. Colonel Arbuthnot shows us a cartridge which I have not seen before. Unfortunately, I have not seen any of the cartridges made lately, and I do not know what cartridge is being used now; he informs us that the bullet is put in by pressure.¹ I must say it would have been courteous on his part to acknowledge where he got that plan of putting in the bullet by pressure. That was Mr. Metford's plan, and it was with some difficulty that the authorities were ultimately persuaded of its advantage. It is Mr. Metford's invention, and it has been carried out for the last fourteen or fifteen years for all his cartridges. I am only glad to find that it has been adopted, and I think nearly as great honour is due to those who will adopt the best work as it is to those who invent it. I hope it will be understood that I have no wish to say anything in the least finding fault with the work done at the Enfield Factory; I am only desirous that everything should be done for the good of the Service and for the good of the country. If it had not been for that, I should have saved myself a great deal of annoyance and trouble, but let that pass. All I hope is that the best rifle will be adopted, and by the best I mean with segmental rifling; that the best ammunition will be adopted, and then I have no doubt that this country will have an arm, not only equal, but far superior to that of any other country in the world.

Lieutenant-Colonel HOPE, V.C.: I will begin, Sir, by saying that I am quite sure no apology is needed from Colonel Arbuthnot, for I never heard a better lecture on any subject as an explanatory statement of what the lecturer desired to explain. I say that, because I am afraid I disagree with Colonel Arbuthnot on some points, and therefore I desire further to say that this is the first time in my life that I have had the pleasure of seeing him, that I have never had anything whatever to do with him either officially or privately, and that I have no sort of bias in the matter. I will begin by making one very slight historical correction with reference to the old Minié rifle. I have no recollection of seeing any smooth-bore muskets in the Crimea. My impression is very distinct that *all* the regiments in the Crimea were, in the first instance, armed with the Minié rifle. As regards the iron cups being driven through the bullets occasionally, I can give him a very curious corroboration of that statement. On the 7th of June, in the Crimea, I found a wild Irishman hammering with a great stone on the top of his ramrod, which was sticking out more than a foot. I knew what was the matter, so I took the rifle away from him and hid it, and told him to take a dead man's rifle. In the morning I recovered the rifle, brought it into camp, and made the armourer-sergeant take out the breech, and found that there were no less than eight of these lead cylinders sticking in the barrel, and this man was hammering down a ninth bullet. Now, Sir, I read with very great pleasure the admission that Colonel Arbuthnot makes as regards the Martini breech action, and I will just read his words. He says, "I am aware that there is much difference of opinion with regard to the merits of the Martini breech action." I consider the Martini breech action to be the worst that was ever invented. I have not invented any small arm myself, therefore I am not speaking for my own arm, but, so far as I know, the Martini is the only breech action which necessitates a straight cartridge describing a curve in entering or being withdrawn from the barrel, and I think there can be no doubt that quite as much of the jamming that we have heard of in the Soudan and elsewhere has been due to that absurd action as to the very bad Boxer cartridges. No other European country has adopted the Martini block, and therefore presumably its inventor was unable to convince any other country that it was a good one, just as no other country has adopted the absurd Boxer cartridge, unquestionably the worst cartridge ever made, and I humbly submit that this is also the worst breech action. And here I will tell you a little anecdote both about breech actions and about cartridges. Just 29 years ago I was appointed Attaché to H.M. Legation at Washington, and on the 19th December, 1857, I sent home a report on the new breech-loading Morse rifle. I

¹ Explained *visà voce*.—Ed.

sent home also lettered diagrams as carefully drawn as I was able to draw them, and a strong report in its favour. So strong and so startling was the statement that I was able to send home, that I was immediately ordered to buy one of these rifles, contrary to the ordinary usages of the War Office, and also a thousand rounds of ammunition, and to send them home. When I had done that, my part of the work was over, but a couple of years later, being in London, I asked what had become of this rifle, and I was told it had been submitted to the usual Committee, which had sat upon it the usual number of months, and had made the usual report. I asked if I might see the report, and the answer was "Certainly." It was as follows:—That it was a very ingenious invention, and it really would do what I said it would do, but it was not adapted for the British Service (it might do well enough for Yankees, French, or Russians), for the three following reasons:—(1.) It fired too quickly—12 rounds a minute; (2.) the cartridges were metallic; (3.) they contained the principle of their own ignition." That was the first metallic cartridge, I believe, ever seen in this country, and I believe the inventor, a certain Mr. Morse, is the true inventor of the metallic cartridge. When the celebrated War Office advertisement came out after the battle of Sadowa, inviting competition for the British breech-loading small arm of the future, that advertisement left everything pretty well open to the inventors, such as length, weight of barrel, calibre, breech action, and so forth, but it went on to say that "all competing rifles must fulfil the three following *sine quâ non* conditions:—(1.) They must fire not less than 12 rounds a minute; (2.) the cartridges must be metallic; (3.) they must contain the principle of their own ignition." Ever since the appearance of that advertisement I am bound to say I have lost all respect for constituted authority. Now with regard to the calibre of the proposed new arm. Certainly 0·40 is an improvement upon 0·45, but I think (if Colonel Arbuthnot will allow me to say so) that my respect for constituted authority is not quite sufficient to enable me to come to the conclusion that 0·40 is the best possible form. That is another question, and I think, if we are to go to the expense in this country of a new rifle, we ought not merely to have the best rifle that Enfield can turn out, but the best rifle that the world can turn out. I think it ought to be thrown open to public competition. Let the best man win, and let us have something approaching finality—the best small arm that the science of the present day, and the workmanship of the present day, can possibly produce. As regards the breech action, I cannot quite assent to the proposition that we must preserve the Martini block because we may have a magazine rifle at a short date from now. If so, let us have it at once. It seems rather a waste of money to introduce an intermediate rifle between the Martini-Henry and this imaginary magazine arm of the future. Let us make one bite of the cherry; it is not a very big cherry. There are plenty of magazine rifles in existence which could be adapted to well-known existing movements, and I do not think that anything in the nature of an experimental breech would be required. I say this with the more confidence because Colonel Arbuthnot says that the action remains on the Martini principle by "the express orders of the Secretary of State." I have now come to understand that the phrase "Secretary of State" is really nothing but a bugbear. Of course, by the Secretary of State, Colonel Arbuthnot does not mean Mr. Campbell-Bannerman; I presume he does not even mean Mr. W. H. Smith, at all events—

COLONEL ARBUTHNOT: I referred to Mr. Childers.

Colonel HOPE: I am very glad to hear it. I do not know that Mr. Childers' successes in the Navy and in the Army have been so great as to prove his opinion absolutely infallible; at all events, I think the opinion of a Board of infantry Officers who have got to use the rifles would be superior even to that of Mr. Childers. That perhaps brings me to the organization of the Ordnance Department. Colonel Arbuthnot is probably as good a man as possibly could be obtained for superintending the factory at Enfield, but I do not know why it should always be an Artillery Officer who settles the form of infantry rifles and cavalry swords, infantry bayonets, cavalry lances, revolvers, and all that kind of thing. I think the artillery have not had such a brilliant success with their own big guns as to justify them in settling the arms of other branches of the Service. I desire, Sir, in conclusion, to enter a very strong protest against that Martini block. I believe it really is, as I have said, the

worst that ever was invented, and for this reason that it forces the straight cartridge to describe a curve in entering and quitting the barrel.

Captain H. JAMES: When I came down here this afternoon it was chiefly with regard to the question of the breech action of the new rifle. Colonel Arbuthnot, however, has said it is retained by express orders of the Secretary of State, and there is, therefore, nothing more to be said on the subject. The Secretary of State is, I am aware, an impersonal entity, and is a difficult person to get at; but in this case the veil has been torn asunder and we are told the gentleman to whom we owe this continuance of the Martini breech in the Service is Mr. Childers. I am perfectly well aware that the Martini breech action is an action that has gone through several campaigns with complete success so far as the action is concerned, but I cannot also be oblivious to the fact that the same may be said with reference to the bolt action—the universal action of every other nation on the face of the globe. Therefore it seems to me, if the argument of the success of a campaign is true of the Martini-Henry, equally is it true of the bolt action. But there are two other reasons why the bolt action should be adopted in any future years rather than the Martini. In the first place the Martini action, by the method of its construction, can never have so efficient an extractor (I venture to differ from Colonel Arbuthnot in his dictum on this point) as can the bolt action. In the bolt action the bolt acts directly on the cartridge, whereas in the Martini you are using the short end of a lever to move the long end to eject the cartridge, and that was one great cause of its failure in the Soudan. If you open the Martini-Henry gun with a jerk your cartridge comes out, but if in the heat of an action you do not open it with a jerk, as may happen if you are not quite as cool as you might be when practising at home—if under those circumstances you do not open it with a jerk, the cartridge does not come out, and then you have very often to go through a long process before it is extracted. I am perfectly aware that one great reason why the cartridges did not come out in the Soudan was owing to their faulty construction, but so long as you have the Martini block in the Service so long will you have jams due to the particular action of the block itself, and therefore the block breech-loader can never be so effective with respect to the cartridge as the bolt. With the millions of fire-arms existing at the present moment in every nation of Europe it is quite out of the question to expect anybody to believe that you cannot extract the cartridge with the bolt action as well as you can with the block action. The second reason why the bolt action is the action of the future is that almost every form of repeater which can be possibly introduced into the Service will have the bolt breech action. The repeating rifle is a question, not of the future, but of the present, for it is almost certain that Austria will at once adopt a repeating rifle which has been experimented on in that country. The same is the case with the German Army. We know a story was told some little time ago in the papers about a Frenchman having stolen a new repeater from the guard-house in Berlin. We know also that for some years the French Government have been making experiments with different forms of repeating rifles because the Kropatschek action used in their Navy has not been thought to fulfil the necessary conditions. The little State of Switzerland, a State which in this particular characteristic has always been the foremost in Europe, has for many years had a repeating rifle. They are now experimenting with another rifle, one which has a very much smaller bore, which carries a lighter bullet, and has a still more flat trajectory than even our proposed new rifle. It seems to me, therefore, considering the fact that there is a repeating rifle in the immediate future,—with the highest respect for Mr. Childers as an authority upon rifles, for I had not hitherto known that that was amongst the many things with respect to which he claims authority,—with the highest respect to him, I venture to think that in any future rifle adopted in the British Service the bolt and not the Martini block should be used. I have one more reason. Anybody who has fired the Martini-Henry lying down knows that it is an awkward weapon to work. The lever being underneath the barrel, you have to turn the rifle round, and it is difficult to extract the cartridge. On the other hand, the bolt action, such as the Mauser or the Gras, or any of the Continental weapons, can be loaded perfectly easily whilst lying down, and the bolt action is infinitely better adapted to cramped positions than any form like the Martini-Henry, where the lever to move the block is underneath. I

venture to differ from Sir Henry Halford on one point on which he differed from Colonel Arbuthnot. I have no hesitation in saying that for a military weapon the Martini-Henry rifle was, except at very short ranges, a far superior weapon to any other weapon which has been used in any Continental army. And that I think is shown by the Russo-Turkish campaign, in which the Turks had practically our own rifle.

SIR HENRY HALFORD: I never said it was not; I said, if it was compared with the rifles in use in foreign armies, it undoubtedly was the best, but if it was compared with other rifles known in this country it was not the best.

Captain JAMES: Then I withdraw my observation. May I say one word in regard to the quick-loader, which very much resembles the Krnka, tried first of all in Russia? It seems to me that anything put on the side of the rifle is bad. For the same reason that the bayonet has been justly turned round, it seems to me to be a bad arrangement to put the quick-loader at the side. The quick-loader is a clumsy substitute for the proper repeating rifle.¹

Lieutenant-Colonel W. C. MACKINNON: I have not had much time to give to the examination of this rifle, but there are many details in it to which I take exception, and these will doubtless be worked out during the practical tests which it has to undergo. There is one point in particular in the lecture with which I cannot agree, it refers to the "jamming" that we have heard so much about, and which the lecturer says is due more to the cartridge than to the action; my experience is the reverse; I have had many opportunities of visiting regiments where jamming has been complained of, and in all such cases, without exception, I found that the actions were out of order, that when pressure had been brought to bear on the armours, and the actions properly adjusted, jamming practically ceased. Jamming is not, in my opinion, so much the fault of the cartridge as of the action; and I may claim some indulgence in speaking of this matter, because I was a sharer in the responsibility of the introduction of the Martini action: when recommended, it stood the tests better than any other action in the competition; the Boxer cartridge was also the best, there was no other cartridge at that time to touch it. With reference to the action of the extractor; instead of the hand working directly on it, the power is conveyed through a series of levers; the cartridge is expanded with immense force, and is consequently tightly held by any dirt or corrosion in the chamber, and the great power necessary to ensure extraction cannot be exerted and properly applied through this series of levers; minor alterations, such as strengthening the extractor arm, may be made, but with the faulty principle the liability to jam will remain. I know it is said that this action is simply a stop-gap, but there is the fear that, once reintroduced, it will be kept on for a long time; there may occur difficulties in altering it, financial, for example; and I consider that its maintenance in the Service until a magazine arm shall be devised, manufactured, and issued would be as great a misfortune as to reproduce ships of the "Warrior" type. With regard to the barrel; the conditions of low trajectory at all ranges, high muzzle velocity and favourable retardation, have been so cleverly combined that, providing it will not foul in excessively hot dry climates, and that its accuracy will be represented by the small diagram shown to us, I think we may be satisfied.

Admiral SELWYN: I should not have risen on this occasion at all but that it seems to me that we are forgetting that most important contribution to the whole subject that was made by Colonel Brackenbury; he called it the "Spirit of Artillery," and I say without fear that to those who will study the question in the spirit in which he attacked it the question of trajectory is one that can be met entirely by the regulation of the powder charge and the bullet, not by any change in the arm;

¹ I said nothing about the cartridge of the new rifle, but I am given to understand that the reason why the bottle-shape was retained is that the Royal Laboratory refused to manufacture the more modern truncated cone form. One of the difficulties that Enfield authorities appear to suffer from is that they are the designers of the rifle only. Waltham decides the powder, Woolwich the cartridge. A private inventor would get exactly what is wanted under the last two heads, and would not be subjected to such interference in his design.

so that I am not afraid to say that I would take the oldest form of breech-loading rifle known, and with a good cartridge, properly filled with powder, I will beat the very last introduction with the lowest trajectory, and that without increasing the weight of the bullet, and while decreasing the weight of the powder. To show how much this is the case I may state that only in the beginning of this year the Germans attempted to make a new description of powder for rifles, and they found that they could get effects with 47 or 48 grains of powder rather superior to what they got with 75 grains before—that is with powder properly made. Mr. Nordenfelt has found that that is the case in his machine-gun, that a certain arrangement of powders known many centuries before the era of modern rifles immediately produces a range nearly double in extent and with corresponding velocity. In these circumstances, it is not worth while in all these investigations not to be bound by that most fatal of all errors which investigators can commit—the adoption of a formula which does not include all the conditions of the problem in hand. It is quite true you may get a bullet that will offer the least resistance to the air, and possibly with a very long range, if it were a weighty material, or, in other words, had a high specific gravity on the formula of $\frac{D^2}{W}$; but in such a case do you fulfil the other

conditions? First of all, do you unduly elongate the cartridge, and therefore introduce enormous difficulties, because the instant you do so you must have a longer breech-block and you must throw away more of the barrel. It seems from Colonel Arbuthnot's paper that, while the rifles are put at 33 inches of barrel, no account is taken of the different methods of breech-loading, which may make a difference of 3 or 4 inches at least. Another question not less important is that of the diameter of the cartridge as applied to all our existing rifles and machine-guns. It is said, "Line up the rifle," but practically you will find in any rifle or in any machine-gun, if you adopt a different calibre, no matter how you "line up the rifle," you will have an enormous difficulty, not only in the supply of multiplied forms of cartridges, but in the arrangement of the internal mechanism, which must be changed altogether. All this is a very serious matter. I urge, therefore, that the utmost attention should be paid, as Colonel Brackenbury said, firstly, to the "spirit of artillery"—the powder; secondly, to the bullet; thirdly, to the cartridge; and lastly, to the rifle. It is now nearly twenty years ago since I drew the attention of this Institution to the value of solid-drawn metallic cartridges. It has taken twenty years to bring out that fact, and now I suppose we shall wait for another twenty years for the best prepared powder. It takes about twenty years on the average to convince the British public that it is not good to do a thing the wrong way first; they generally do it, and they mostly suffer. The next question to be raised is, are we going to have this magazine arm, or are we going to have an intervening arm, which, I presume, is to be supplied to the whole army, both in Europe and in India? How long will it take to do it? What is the prospect of getting a magazine arm if this is done, and why should not we have the magazine arm at once? Why on earth are we to pass through an intermediate stage which is acknowledged to be an inefficient stage, and which does not provide any greater supply of cartridges, but rather complicates the greater supply of cartridges by introducing a new cartridge? Why should not we occupy the time in settling really the question upon the basis of scientific investigation such as I have described, instead of putting into the hands of the troops a new arm which will require new drill and a new set of experiments all over the world to establish its value, and which perpetuates the evils attending the extraction of the cartridge. To pass from that to the bayonet: I should like to ascertain, if possible, when and why the bayonet was made two inches longer, because I can recollect the time in my early experience when I was told distinctly that, in view of the constant fact that the ends of bayonet sheaths will come off in long service, the bayonet length had been settled, because it was the length which a man could double at without sticking the end of the bayonet which was exposed into his calves. I know we have now a steel sheath, but that is almost as bad in this and other ways. I believe the length of the bayonet was increased to that extent, and that it was found necessary to do so in order to make up the length of the barrel to the proper length desirable for thrusting with the bayonet point, and I think, in doing so, that some former experience has been forgotten. It seems to me that our

bayonet sheaths in long service are sure to be liable to the same objection as was formerly raised. I also think that you might do away with the ramrod altogether and might substitute a more useful thing. I do not think that the bayonets should be used to dig with, but I do think that there is an enormous advantage in suppressing every ounce of weight in favour of cartridges. If you can take away one pound of weight and give the men ten additional cartridges, so much the better. We carry that useless block of weight, the stock of the rifle; what is the good of it? Ought it not to be full of cartridges? These are things that we should like to see carefully examined before we see a little change in the curve of the wood and in the arrangement of the bayonet, which is to be considered sufficient to re-arm the troops of Great Britain. Above all, it should not be done under the influence of reports made on previously defined and limited lines. The essence of a good and sound report is that it shall be a report on the action of facts ascertained in your own knowledge. I do not care for a formal report which has certain lines which you must answer, and leaves out altogether certain other lines which you might answer, but which you do not find called for in the report. I say that that is not a report such as the country ought to rely on. It has been the system which has been adopted, but in my opinion it is a very wrong system. No doubt the truth will and has come out on active service, but that is the very last place where we should like it to come out. I therefore deprecate any attempt to solve this question by such a system as is now being acted on, for I am quite sure it can only lead to continued error such as we have seen in the past, and such as we shall again uselessly regret in the future.

Colonel WAKE: As Colonel Hope has given you his experience of the War Office, I should like to tell you mine. I took the trouble to make twenty steel cartridges and to drill them out the same bore as the Martini-Henry rifle. Into these cartridges I put 75 grains of powder. I fired them against Martini-Henry cartridges from the same rifle through the platoon screen, and my 75 grains of powder in a uniform bore gave exactly the same muzzle velocity as 85 grains used in the bottle-nose cartridge. The bottle-nose cartridge, as it is shown here from the larger base with the gas acting down the barrel, gives ever so much more recoil than if the cartridge were uniform in form. Colonel Arbuthnot does not tell us the difference of recoil as between our rifles and foreign rifles. Now I am positive that anybody who has had anything to do with shooting knows that the question of recoil is one of the most serious difficulties you encounter in teaching young soldiers. Neither does he tell us, if I remember rightly, what is the weight of ten rounds of this new ammunition. I believe, from working at it, that it is heavier than the Boxer, therefore, in carrying sixty rounds, which with the old cartridge weigh 6 lbs., he has now to carry 7 lbs. With the new rifle that is to be brought out, I certainly think he ought to be able to carry ninety rounds without carrying any more weight, and I am certain that such a result would meet the approval of Officers who have seen active service.

Colonel ARBUTHNOT: The recoil of the new rifle is to all intents and purposes *nil* at the man's shoulder, because the bullet is 100 grains less in weight. As regards the weight, seventy rounds of ammunition will be carried.

Colonel WAKE: I should like also to be told the actual figure of merit of the diagrams that are shown, because, unless the figure of merit is worked out, it is impossible to make a comparison of that shooting with the shooting of other rifles.

Colonel ARBUTHNOT: The figure of merit is marked on the plan.

Major KITCHENER: Captain James has mentioned that the Austrians are about to introduce a magazine rifle. I may mention that yesterday I saw in Pall Mall the authorized field pattern of the German magazine rifle as adopted by them. It contains eight cartridges, and a very ingenious contrivance for closing the magazine so as to use it as an ordinary rifle. The new cartridge comes up and the old one is ejected by a simple movement of the hand.

Captain LUMLEY: I do not want to add much to this discussion. An attack has been made upon Mr. Childers for what he did. I think Mr. Childers spoke more as a statesman and economist than as a General. And I think also Mr. Childers had a very good precedent for what he has done, because we know on the highest authority—German and French—that they have already decided on adopting a repeating

rifle; and the only reason why it has not been carried out is an economical one, arising from the expense that will be incurred. I have no doubt that is the reason why Mr. Childers decided in the same way.

Captain JAMES: I should like to be allowed to explain that I did not mean personally to attack Mr. Childers. I should think it unbecoming on my part to do so, especially as he was sheltered behind that very strong iron-plated target, the Secretary of State for War. I merely wished to draw attention to the fact that in this case we knew what we do not often know, who the Secretary of State really was. Captain Lumley says that the Germans are going to introduce a repeating rifle; it seems to me *raison de plus* why we should not have this intermediate step typified by the Martini-Enfield.

Mr. HENRY WHITEHEAD: I should like to say a word about the block. There is one point that is very important. With the Martini breech-loader, we cannot see through the barrel clearly, neither can we clean it out from the breech,—a very important thing with all rifles. I have had very little opportunity of seeing the new rifle, but there is one objection to it, and that is the wooden shield. I am sure on active service that would very soon get broken. The same object might be attained by putting a piece of strong leather over the barrel. I can only endorse every word that Sir Henry Halford said about the grooving. I am sure there is no comparison between the ratchet and the segmental. I say that with some little experience, for I have shot with nearly every English rifle brought out within the last 27 years. I should like to suggest whether in an experiment like the present it would not be better to send out say 100 rifles, not only to the best shots in the army, but also to the Volunteers, and not only to the Volunteers in England, but also to the rifle shots in India and our Colonies. Let us get their experience not only in the English climate, but in every climate. Many Volunteers have their own private range, they have every opportunity of testing rifles thoroughly, and I am sure a little of their experience would be of very great service. I can also endorse what has been said about having this rifle as a kind of stop-gap,—it is nothing more nor less. If we are to have magazine guns, let us have them at once.

Colonel SLADE: Sir Archibald Alison, I should like to say a few words on two points. I think the gravest objection to the Martini action has not been stated, and that is, with the prospect of the introduction of a magazine arm at no distant date, the mechanical impossibility of adapting the Martini action to a magazine weapon; and so, by perpetuating the Martini action for the Services, we have, so to say, on account of the great expense,—that would be the reason urged against another change,—put off the introduction of a magazine arm for possibly from 10 to 15 years. I do not pretend to touch upon any manufacturing details, because they have been dealt with so ably by other gentlemen who have spoken, but I have always thought that the mechanical impossibility of adapting the repeating or magazine system to the Martini action should have prevented us from perpetuating that action. There is one other point, and that is the quick-loader. Colonel Arbutnot is a manufacturer, and he has turned out an extremely ingenious quick-loader, but I want to know where our young soldier is to carry it. When he has his valise and great-coat, his pouches, side-arm, haversack, and water-bottle, there is absolutely not room to hang a fourpenny piece on him anywhere,—he is not large enough. It would be a very awkward thing to carry a quick-loader of that nature permanently attached to a rifle, and if you do not carry it permanently attached you must carry it on the soldier's person, and I have looked at soldiers in marching order and tried to find out a place where to put it in vain. I think the only suggestion made was that he could slip it in his pocket. I think, probably, seeing that he sometimes has to sleep in his clothes, he would not carry it long, but would throw it away. Personally I strongly object to having a metal quick-loader of that description. It would add very little to the quickness of loading, it would be highly inconvenient to carry, and it also adds to the weight of the arm, and would burden the soldier with an additional article to look after and carry.

Colonel ARBUTHNOT, in reply, said: The chief point raised by nearly every speaker has been the condemnation of the Martini action. I do not wish to say anything either for or against the Martini action, it has nothing to do with me, and,

in describing this new rifle as compared with foreign arms, I have done so more with regard to the power of the rifle as a military weapon than to the particular means of closing the breech. After all, that has nothing to do with what a rifle will do; what the rifle can do depends upon the cartridge and barrel. The same cartridge can be adapted to a magazine arm, whatever breech action you have behind it. And as to saying that, by manufacturing this arm, you perpetuate the Martini action, that is not necessarily the case, because, whatever magazine arm is to be adopted, whenever that is determined upon, the new barrels and a great part of the rifle can be put on to the new action, whatever it is; the question of the magazine and breech has nothing whatever to do with the barrel,—they are totally distinct questions. And, as we must have made rifles of some sort, it seems to me it is best to go on with a rifle which we know is not a bad one rather than make no rifles at all, waiting till the question of the magazine arm is decided, for that is what it would amount to. With regard to the magazine arm, I have not said a word about magazine rifles in this lecture, because it is a lecture on single-loading rifles. When the time comes, and when the magazine arms are out for trial, I shall be quite prepared, if it meets with the wish of the Council of the Institution, to read another paper on magazine arms in which I will deal with the different patterns which are in use in Europe, and which have been presented to the Committee in this country for trial. It may not be generally known that the Committee on magazine arms, of which Sir Henry Halford and Colonel Slade are both members, has been sitting for nearly three years, and it has recommended two rifles for trial which are at this moment in process of manufacture, 2,000 for the Navy and 300 for the Army. The Navy undoubtedly will adopt a magazine rifle, and I have not the smallest doubt in the world that before a couple of years are out the magazine rifle will be in use in our Navy. Therefore, I do not think the introduction of the new arm can be looked upon in the light of a stop-gap, and it will not delay the introduction of the magazine rifle by one single day. The magazine rifle which we have recommended—and no doubt Sir Henry Halford and Colonel Slade will bear me out in this—is superior to any magazine rifle in Europe or America with which we are acquainted. I do not wish to argue the point as to whether what I said in my lecture, that the Martini-Henry, at the time of its adoption, was the best military rifle in Europe, is strictly correct. I meant that it was the best Service rifle. I did not mean to say there was not a better rifle in existence at Wimbledon, and I do not wish to argue that particular point. With regard to the trajectory which Sir Henry Halford spoke about as being compiled by Bashforth's tables and not by Metford's, that is a question which does not affect me or Enfield at all. Those are things laid down by authority. Bashforth's at present is the authorized formula to be used in calculating trajectory; whether he be right or wrong has nothing to do with me. All these trajectories are compiled according to Bashforth's tables, and if the Metford gives a better trajectory than the Bashforth, so much the better for the rifle. As to the form of the grooves, I am not at all wedded to any particular pattern, but in introducing this pattern we had to be governed partly by the question of repair of old arms. We are making rifles now for experiment with the Metford grooving, and if it be found to be better in hot climates I shall be the last to wish to see the form now used in the new rifle kept up. That is simply a question of trial, it does not affect the shooting a bit. All that is wanted is to make the bullet spin and to keep the rifle clean. The best form of groove to do that certainly ought to be adopted, and if the Metford turns out to be the best, it will be adopted. I am sorry that Sir Henry should accuse me of want of courtesy in not saying that the idea of putting the bullet into a cartridge by pressure was Mr. Metford's invention. I hardly think he was justified in saying that. I certainly did not wish to take claim for a thing that we had not invented at Enfield, and if I did not say who was the inventor it was simply because I did not know. I did not get the idea from Sir Henry Halford; I got it from the Americans, who have put their bullets in by pressure for a long time. I may also add that we do not make cartridges at Enfield.

SIR HENRY HALFORD: I did not for a moment suggest that Colonel Arbuthnot kept it back wilfully; I only wished that attention should be drawn to it. The invention was distinctly first made by Mr. Metford, and it was pointed out by me to

Colonel Arbuthnot. He might have heard of it before, but I had great work to get this system adopted amidst great opposition.

Colonel ARBUTHNOT: I think reference has been made to the question of the steel cartridge case, and to the additional velocity gained thereby. The real reason for that is that it fits the chamber more closely, because in the Boxer cartridge there is a very large air space, and consequently a great deal of pressure, when the powder is ignited, is taken up in swelling out the cartridge to the walls of the chamber. I do not think the fact that the cartridge being made of steel or brass, if it fits accurately to the chamber, would affect the question of velocity one bit. If the cartridge is filled up entirely by the powder, and the whole force of the powder is exerted in expelling the bullet and not swelling out the cartridge case, you will undoubtedly get a higher velocity than you will when part of the force of your powder is taken up in doing work which it is not supposed to do,—that is, swelling out the cartridge case. If you have a big chamber and a small cartridge, you lose velocity.

Colonel WAKE: That is hardly proved, because the Boxer cartridge will give quite as high a velocity as a brass-drawn one. I have tried it myself, and I have seen it tried many times with the Gatling.

Colonel ARBUTHNOT: The Gatling cartridge gives 50 feet more velocity than the Service cartridge,—that is a well-known fact,—it has a smaller chamber. What Admiral Selwyn says about the powder is quite true. If we can get a better powder, no doubt we shall get the same velocity with a smaller charge; but I do not think that the rifle should necessarily be kept back until we have got a better powder. The barrel will do just as well when we have invented a better powder. A new powder will always give a higher velocity than an old one, but in our conditions of service, when cartridges may be made nine or ten years before they are used, we must have a good keeping powder. Our conditions are not so easy as those of foreign countries which have no Colonies. Our soldiers are called upon to fight in every climate, almost from the Arctic regions to the tropics, in wet, cold, drought, heat, and every sort of condition, and our magazines are all over the world,—in wet places like the West Indies and the Mediterranean, and in dry places like the Punjab,—so that we must have a good keeping powder. It is not so easy to get a strong powder which will also be a good keeping powder; and it is far more disadvantageous to have a powder that, after being made five or six years, gives very bad results than to have a powder which gives a little less good results at starting, but will maintain those results as long as the cartridge remains in store.

Admiral SELWYN: I did not refer to any different powder to what we have now got—it is the proper mixture of the best powder.

Colonel ARBUTHNOT: I am sure, if the authorities at Waltham Abbey will give me a better powder, I shall only be too delighted to have such a powder as gives better results. It is a thing that I am always asking for myself, but I cannot get it. I should have thought, although the men of our Army are very much cumbered with water-bottles and what not, that they could find room for a small article of furniture like the "quick-loader." It is only meant for outpost duty, sentry work, and so forth, to give the soldier facility for loading without having to fumble at his pouch when his fingers are frosty or wet. It is simply to help him to load quickly; it is not meant for anything else: it is not meant to take the place of the magazine. I am very pleased that nearly all the discussion has been directed to the abuse of the Martini action, and very little to the abuse of the power of the new rifle, and I am very glad to think, as far as I have been able to explain it, that it has met with the approval of those Officers who have listened to my remarks.

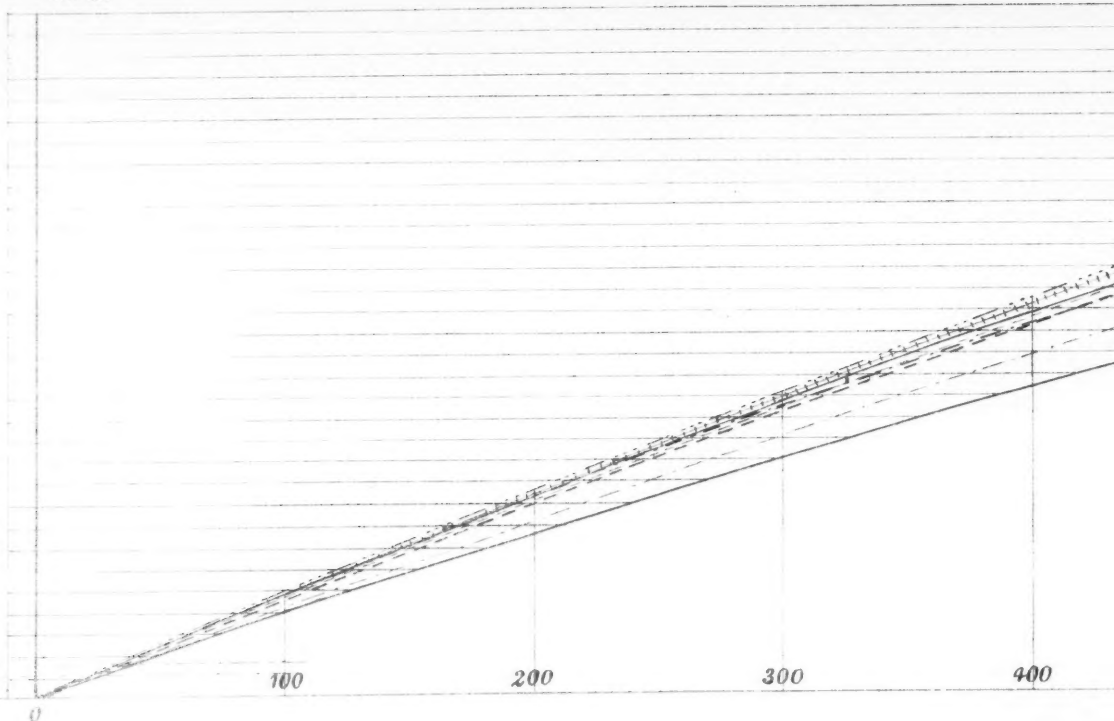
The CHAIRMAN (Sir A. Alison): I think that this discussion has been a very interesting one, and it has brought forward a great many important points. It has taken, perhaps, a larger range than was quite justified by the lecture, and has extended into matters which were rather beyond its scope; but it was both varied and suggestive; and I am sure will have done good by directing attention to the subject generally. There is one point which I feel very strongly about, and it is this. We have heard a great deal as to waiting until we have got the most perfect weapon, until we have secured a perfect breech-loader, before we make a change. Well, gentlemen, I entirely go

against this. We are a very great Empire, and we have got a very small Army. We have connections and interests in every part of the world: we may at any moment be brought into a state of war with another country which can put larger armies into the field than we can, and our only chance of success is that our Army, small as it is, should be composed of men better equipped, better, if possible, in discipline, and infinitely better certainly in arms. Hardly a year ago we were on the edge of a war with a Great Power, and we had a weapon inferior to that which would have been brought against us. Now, to those who have had anything to do with matters of that kind, this is a most appalling state of things. At whatever risk, at whatever sacrifice, our only chance is always to keep our armament, at least, ahead of other nations. We cannot compete with many States in numbers; but we have greater wealth than any; and it will be a shame and a disgrace to the British name if we ever go down with a crash because we have grudged the money necessary to arm our soldiers with the best of weapons. As far as things have gone, I think there seems a general consensus of opinion that the barrel of the new weapon is an admirable one, and that when our soldiers get it into their hands they will have the best military weapon with which at this moment any of the Great Powers of Europe are armed. Now I think that is a matter of enormous consequence. Let us by all means get a perfect breech-loading rifle the moment we can; but do not let us lie defenceless in the meanwhile, waiting for a perfection which has not yet been attained. I am happy to hear from Colonel Arbutnot, what I did not previously know, that the new barrel can, if necessary, be used in a repeating rifle. This is a matter of great importance because, should a repeating rifle ever come generally into use, it will enable the change to be made at a comparatively small cost. The discussion has been a valuable one, and I hope will attract public attention to some of the points which have been brought before us. I am sure you will agree with me in thinking that the lecture itself was an admirable one, well put together, clearly expressed, and containing much and most useful information in a small space, and that, therefore, you will join with me in giving our very best thanks to Colonel Arbutnot for having brought so important a subject before us in so interesting a form.

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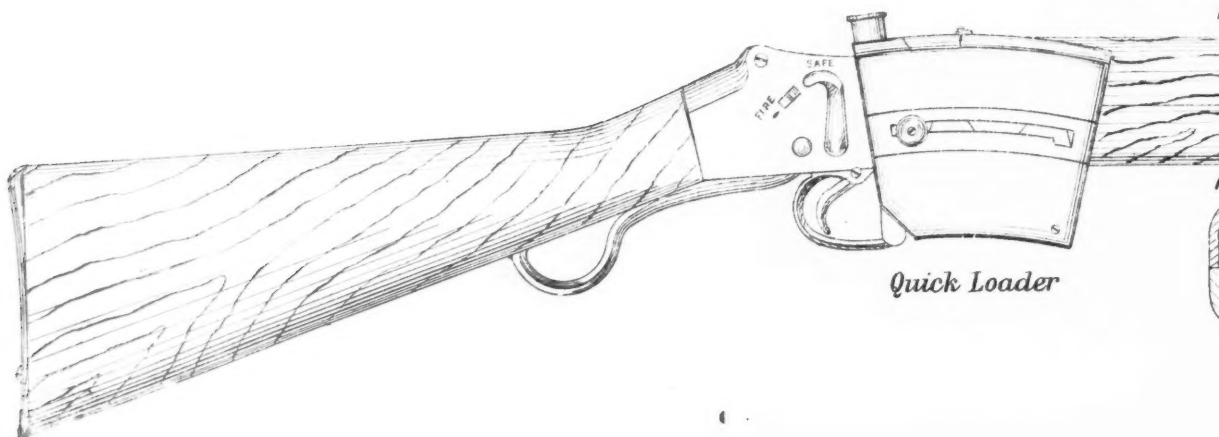
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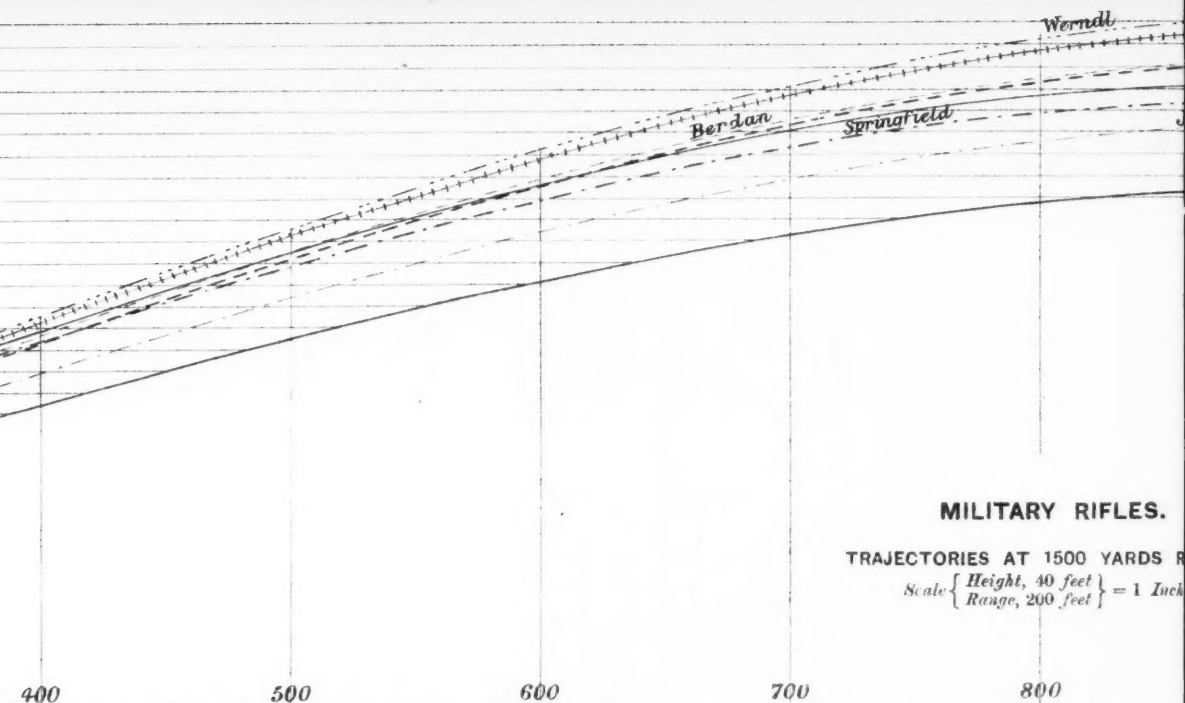
ALRY HEIGHT
NTRY 11



ENFIELD MARTINI RIFLE

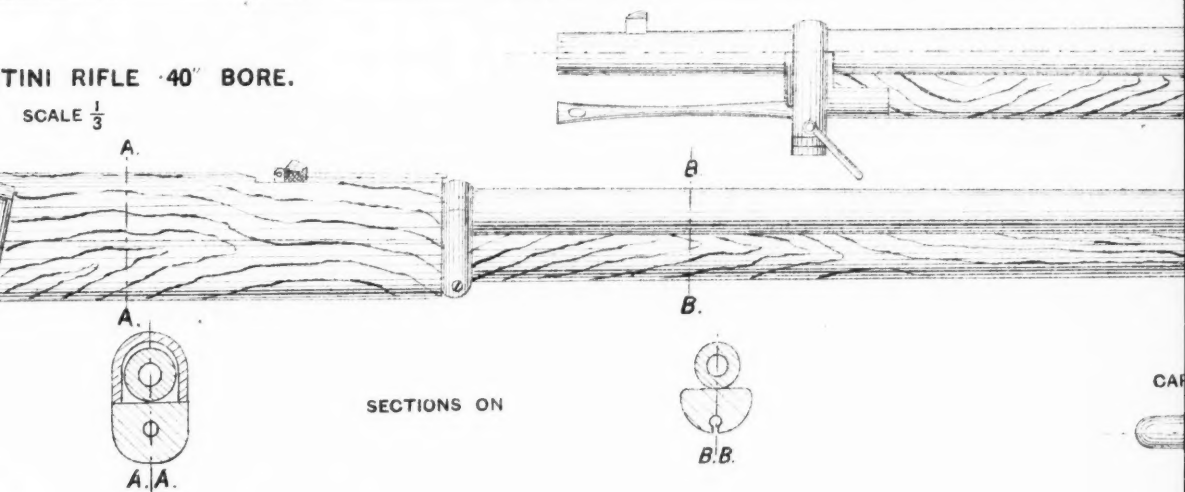
SCALE $\frac{1}{3}$

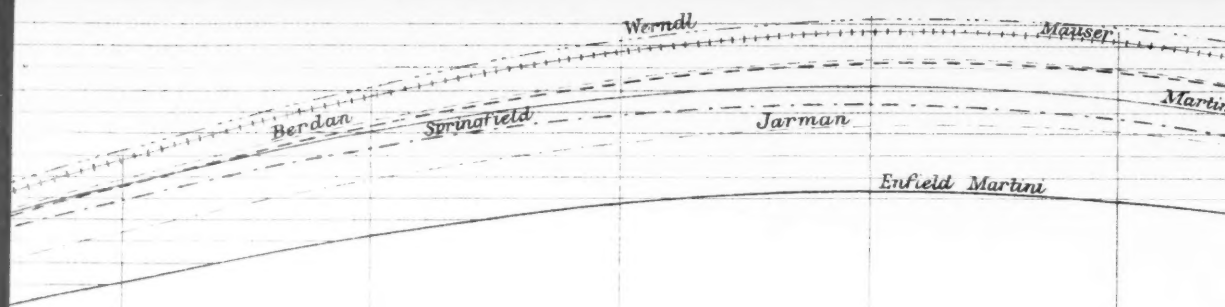




TINI RIFLE 40" BORE.

SCALE $\frac{1}{3}$





MILITARY RIFLES.

TRAJECTORIES AT 1500 YARDS RANGE.

Scale { Height, 40 feet } = 1 Inch.
 { Range, 200 feet }

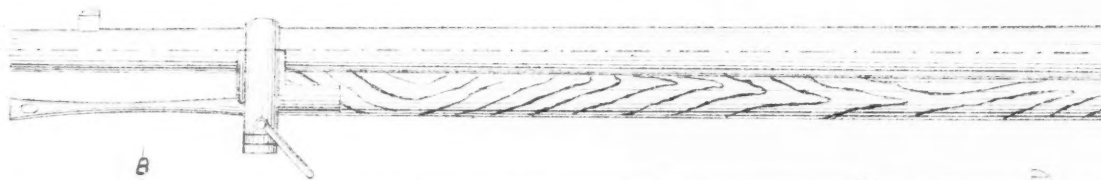
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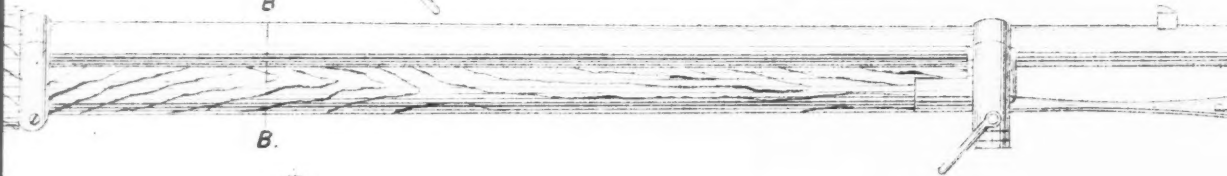
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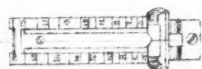
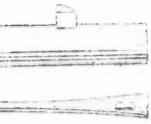
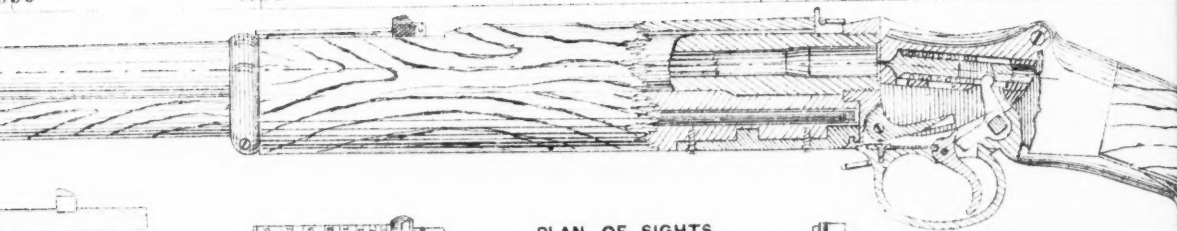
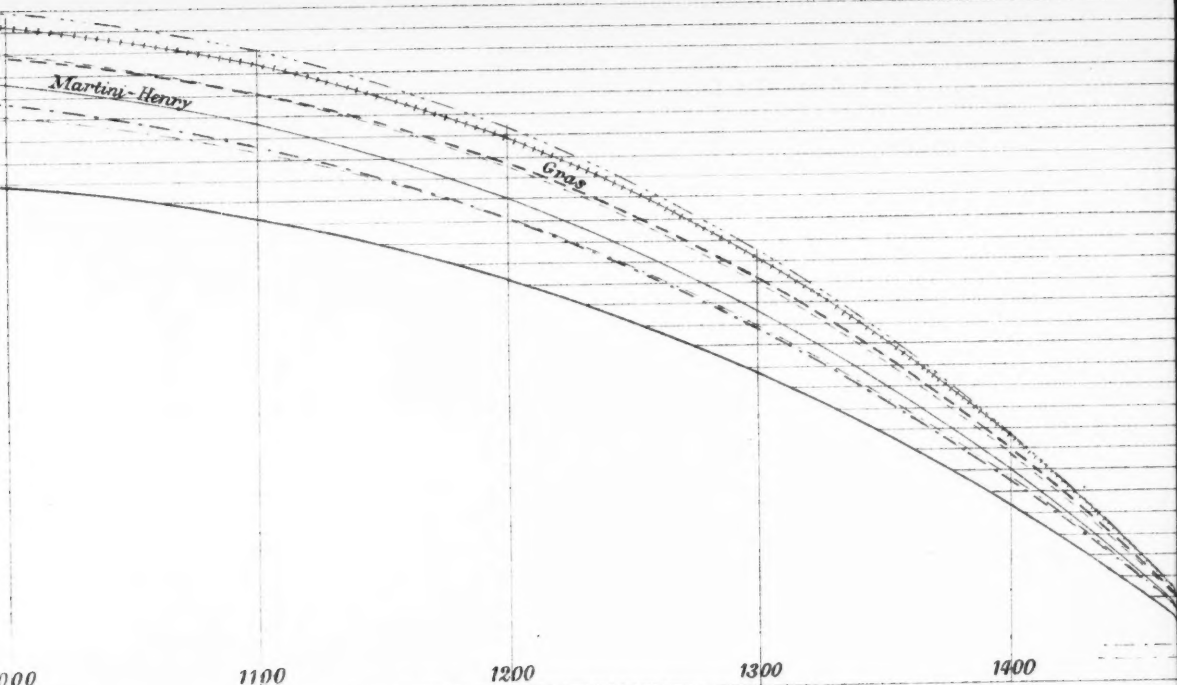


B.B.

CARTRIDGE. HALF SIZE



ONS ON

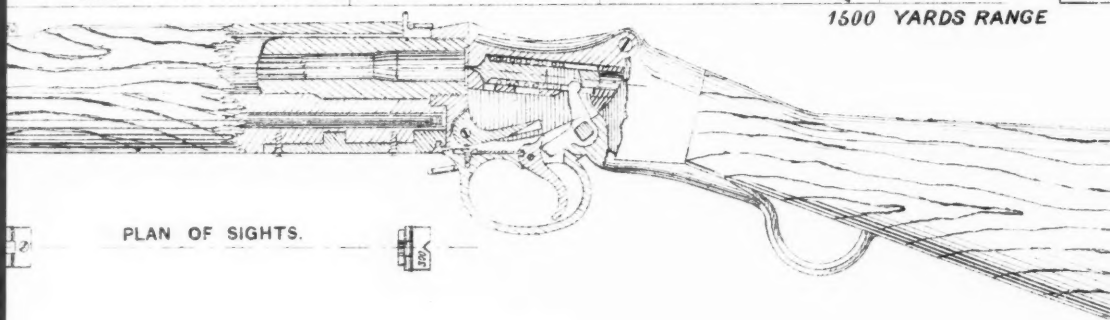
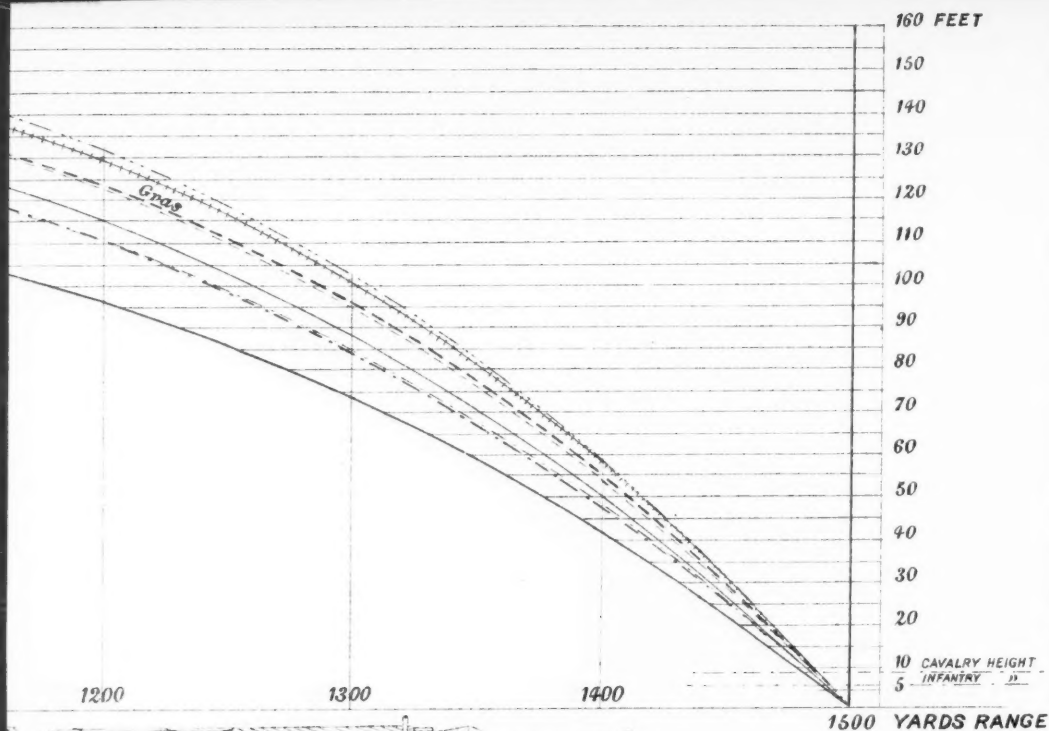


PLAN OF SIGHTS.



JAG.



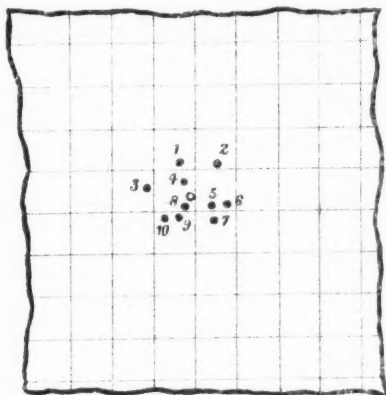


UAG.

ENFIELD MARTINI RIFLE 0.40 BORE.

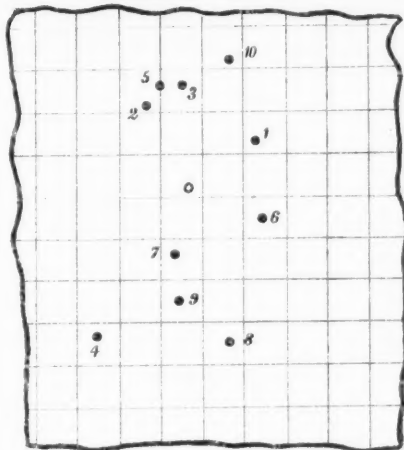
10 SHOTS AT 500 YARDS RANGE.

DEVIATION FROM MEAN IMPACT '35'.

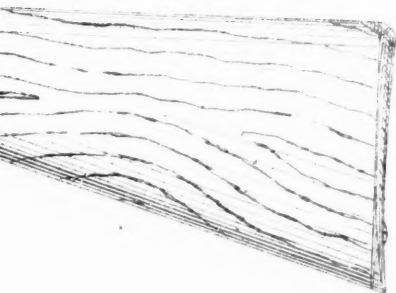


10 SHOTS AT 1000 YARDS RANGE.

DEVIATION FROM MEAN IMPACT 1'32'.



HEIGHT
" "
RANGE



SECTION OF RIFLING.
ENLARGED 6 TIMES.

DIAMETER OF BORE .402"
7 GROOVES.

TWIST OF RIFLING 1 TURN IN 15"

DEPTH OF RIFLING AT MUZZLE .005"
BREECH .008"

FEET
50

40

30

20

10

CAVALRY HEIGHT

INFANTRY "

100

200

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CAVALRY HEIGHT 8' 6"

INFANTRY " 6' 0"



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300 ft or 100 yds.

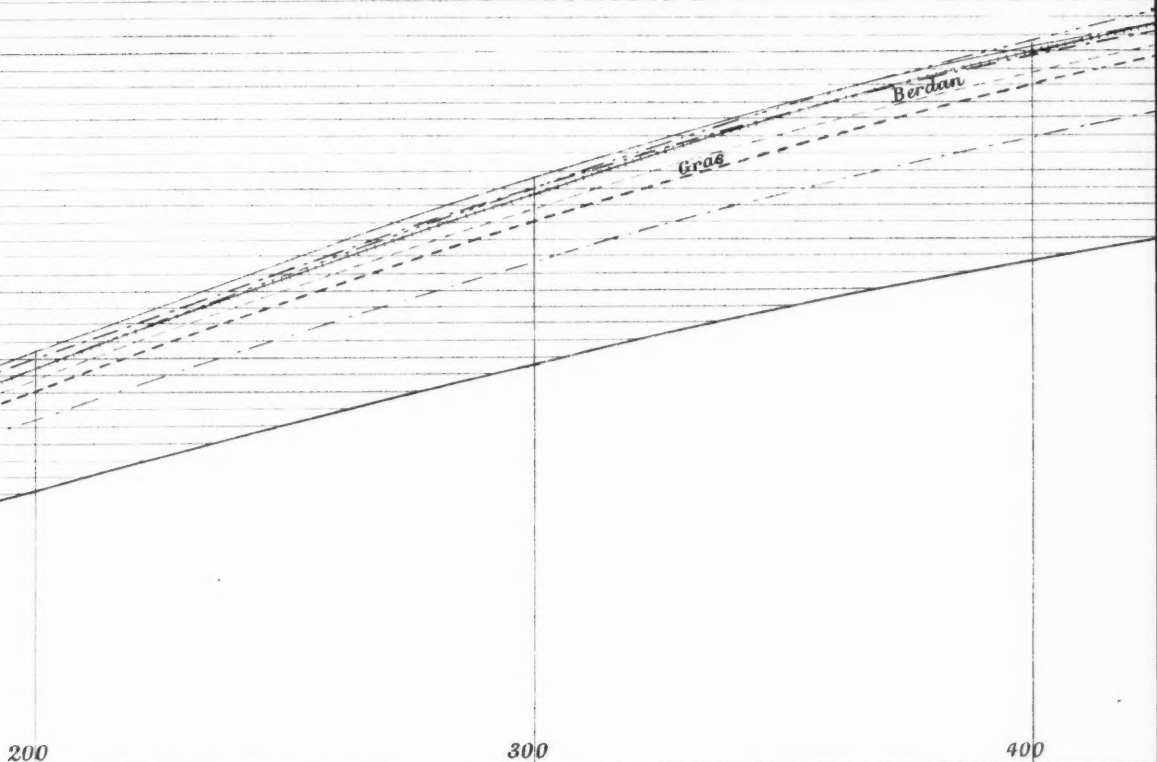
100 YDS. RANGE

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2.07 " H. P.

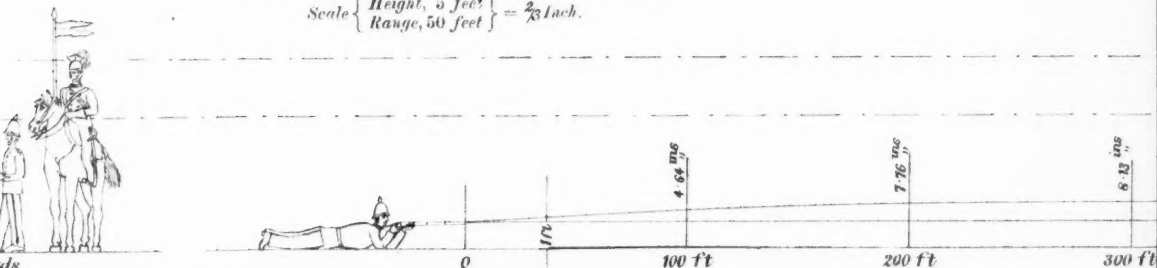
1.88 "



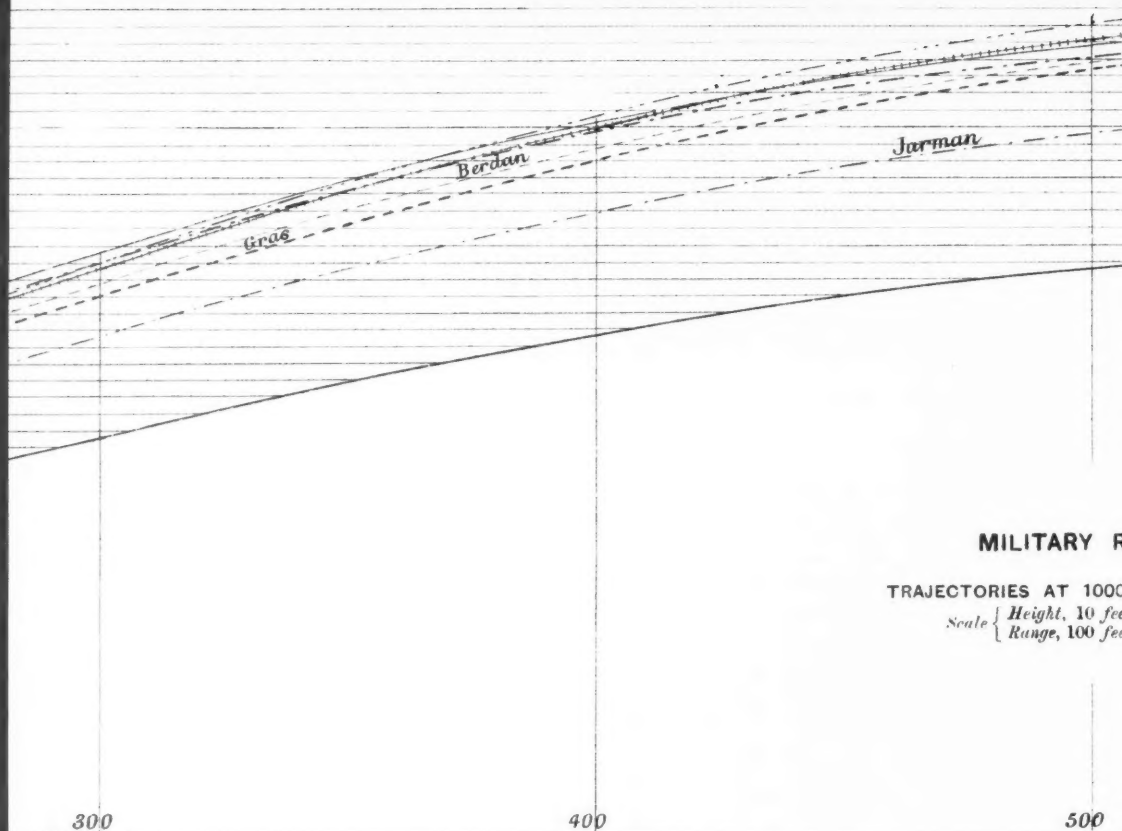


ENFIELD MARTINI RIFLE .40 BORE.
TRAJECTORIES AT 100 AND 200 YARDS RANGE.

Scale { Height, 5 feet } = 2 1/8 inch.
 { Range, 50 feet } = 1/8 inch.

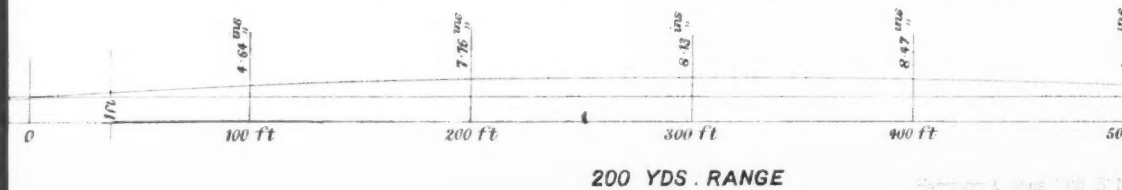


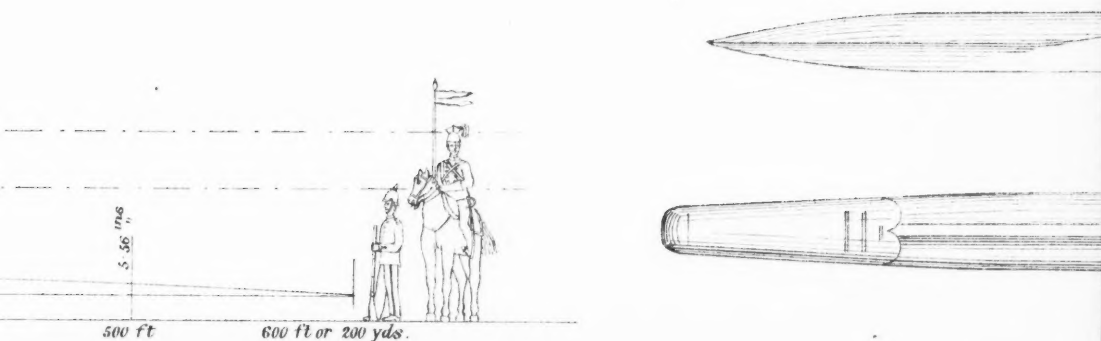
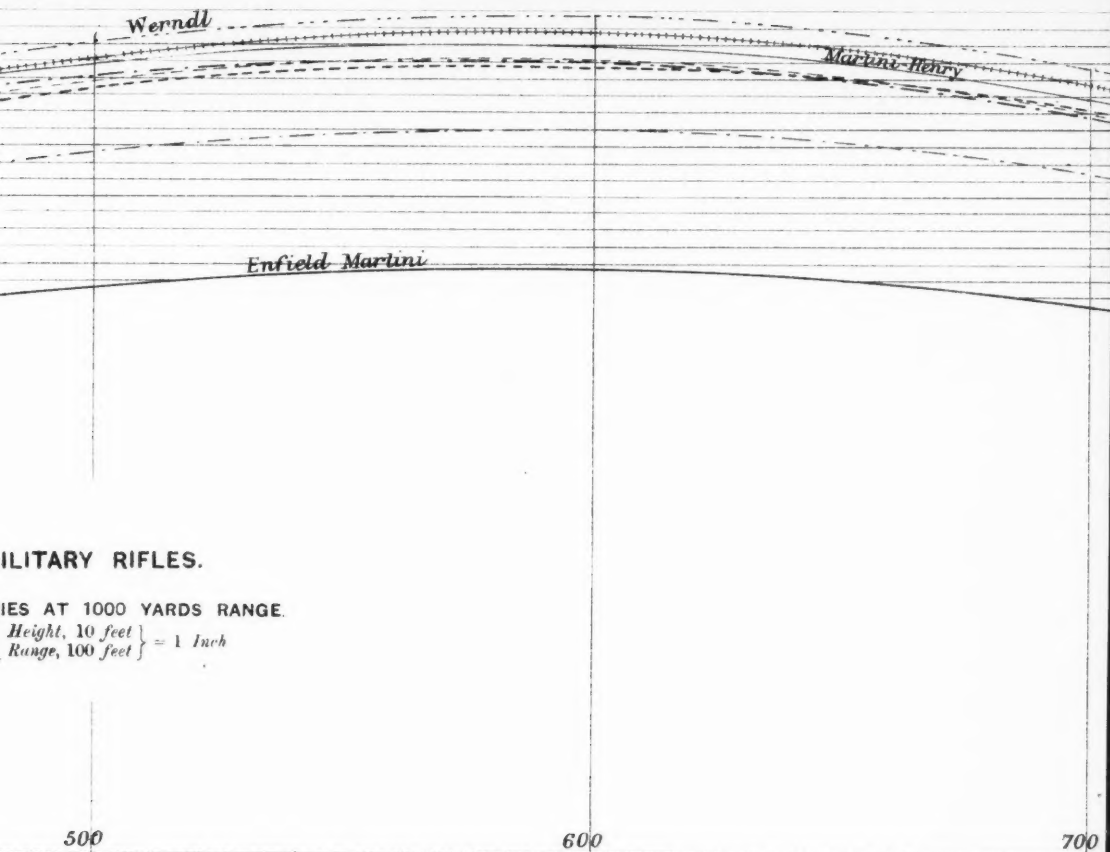
200 YDS. R

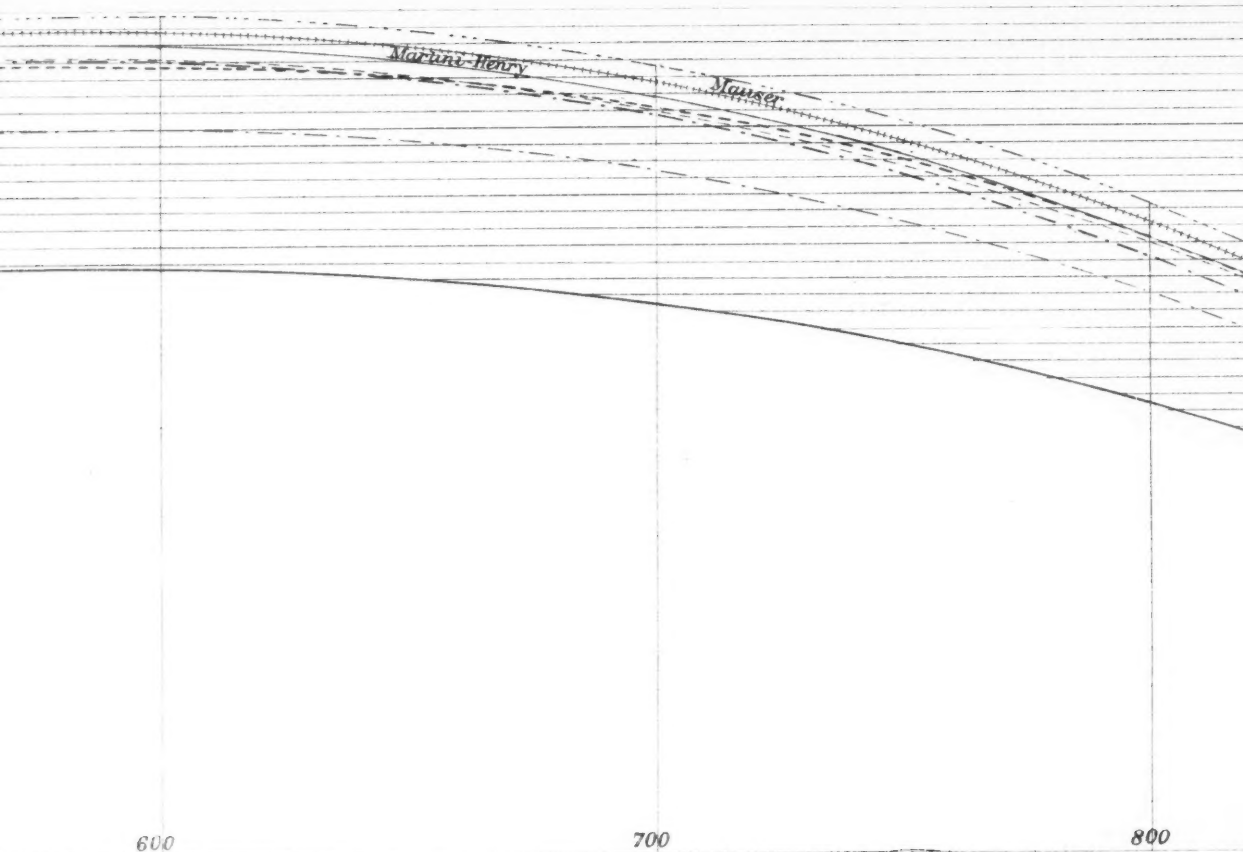


RIFLE .40 BORE.
AND 200 YARDS RANGE.

$\left. \begin{matrix} \text{feet} \\ \text{feet} \end{matrix} \right\} = \frac{2}{3} \text{ inch.}$







SWORD BAYONET



SCABBARD



FEET
50

40

30

20

10

CAVALRY HEIGHT

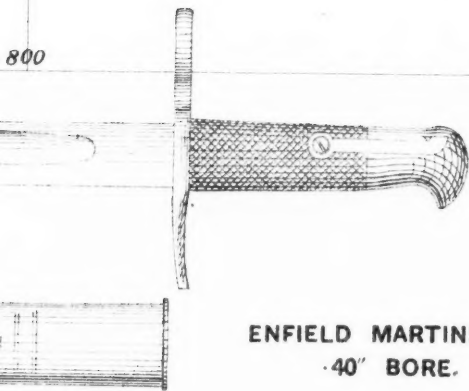
INFANTRY

"

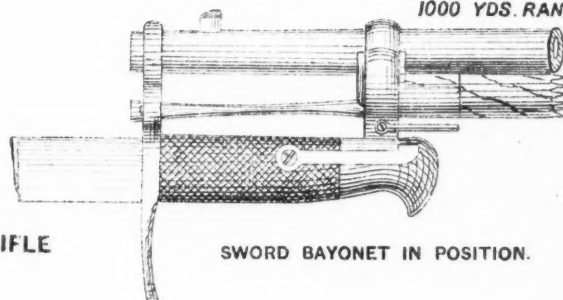
1000 YDS. RANGE

800

940

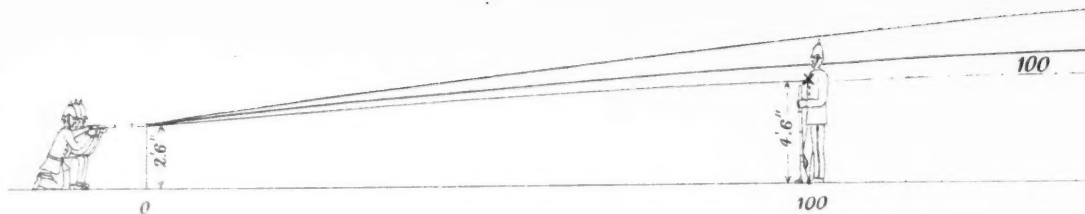


ENFIELD MARTINI RIFLE
40" BORE.



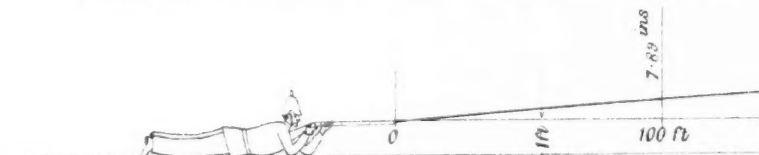
SWORD BAYONET IN POSITION.

SCALE $\frac{1}{3}$



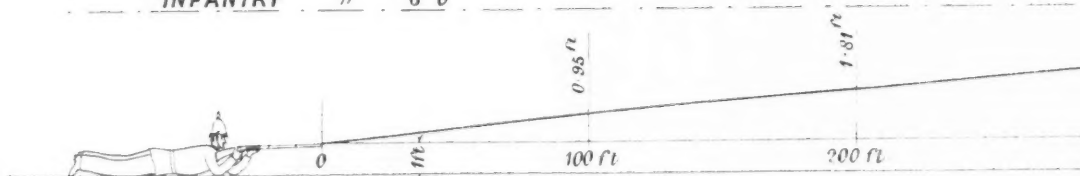
CAVALRY HEIGHT 8' 6"

INFANTRY " 6' 0"



CAVALRY HEIGHT 8' 6"

INFANTRY " 6' 0"



FEET

9

8

7

6

5

4

3

2

1

0

CAVALRY HEIGHT

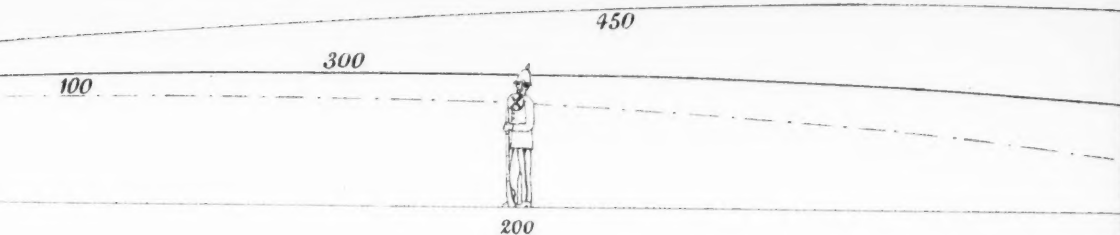
INFANTRY "

100

ENFIELD MARTINI RIFLE .40" BORE.

TRAJECTORIES SHOWING MAN HIT AT 100 TO 500 YARDS

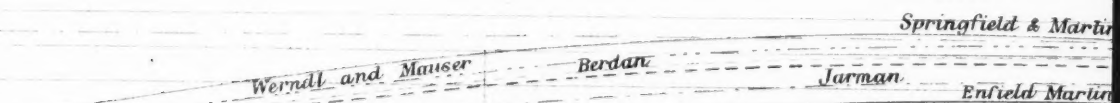
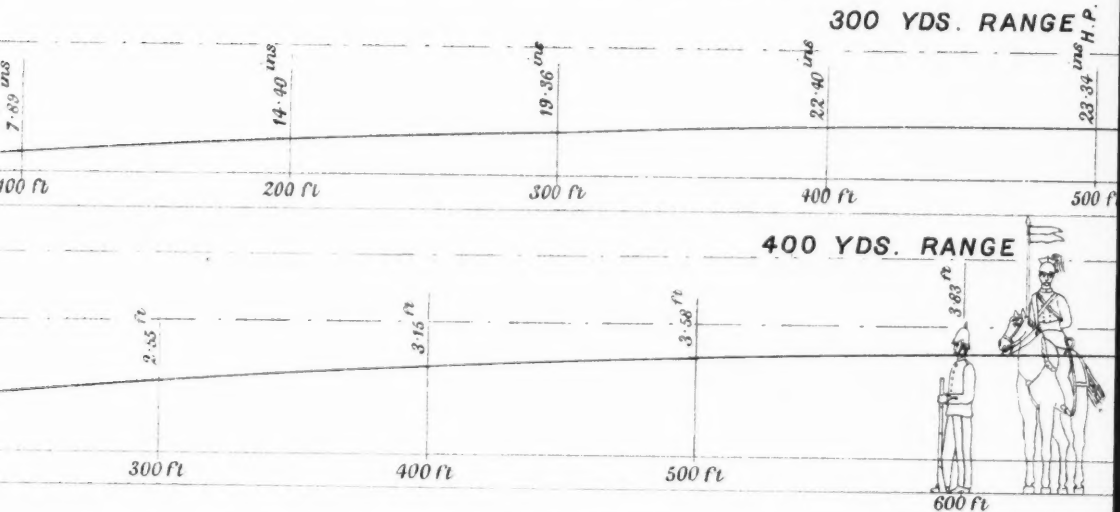
Scale { Height, 7.5 feet } = 1 Inch.
 { Range, 75 feet }



ENFIELD MARTINI RIFLE .40" BORE.

TRAJECTORIES AT 300 AND 400 YARDS RANGE

Scale { Height, 5 feet } = 1/3 Inch.
 { Range, 50 feet }



MILITARY RIFLES.

TRAJECTORIES AT 500 YARDS RANGE.

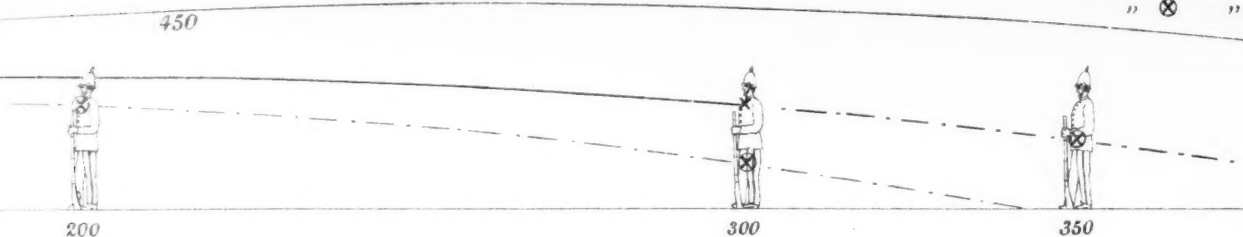
Scale { Height, 5 feet } = 1 Inch.
 { Range, 75 feet }

ENFIELD MARTINI RIFLE .40" BORE.

TRAJECTORIES SHOWING MAN HIT AT 100 TO 500 YARDS RANGE.

Scale { Height, 7.5 feet
Range, 75 feet } = 1 Inch.

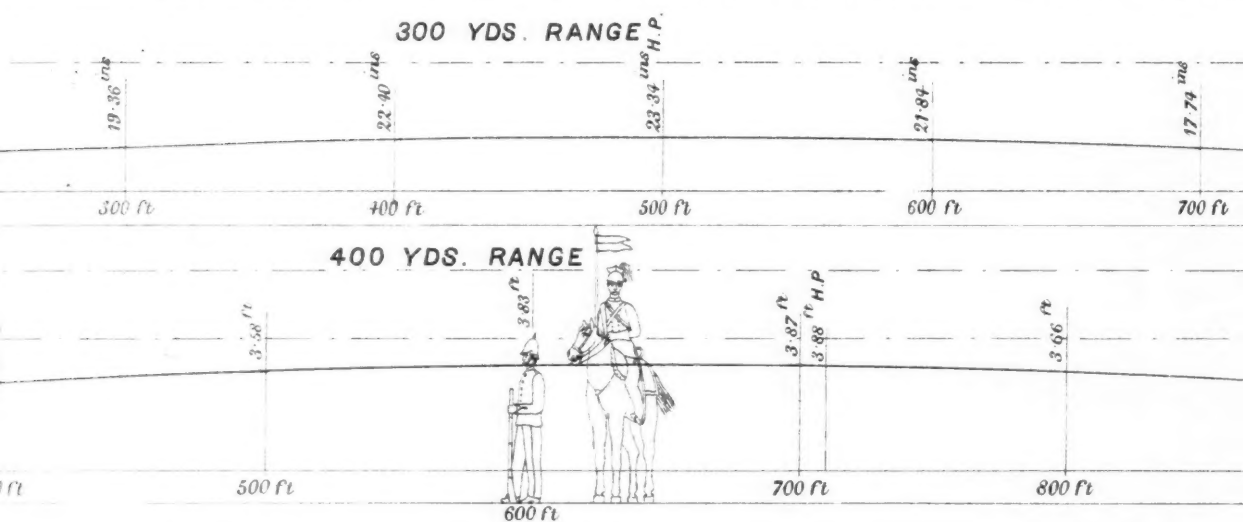
Note, -The x deno
" x "



ENFIELD MARTINI RIFLE .40" BORE.

TRAJECTORIES AT 300 AND 400 YARDS RANGE

Scale { Height, 5 feet
Range, 50 feet } = 1/3 Inch.

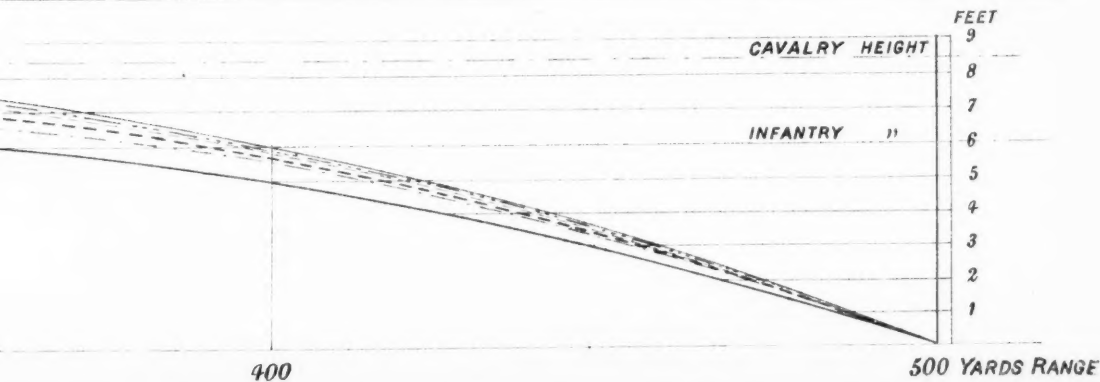
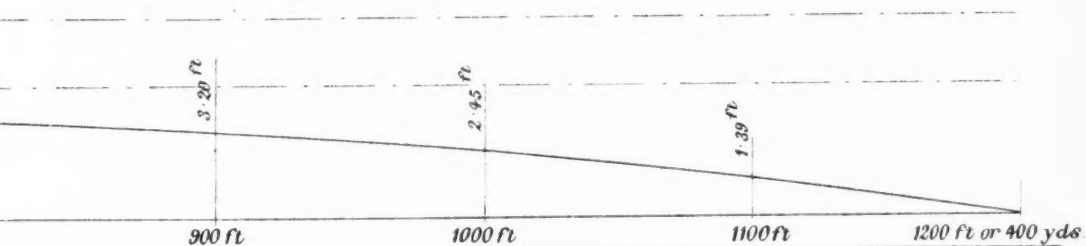
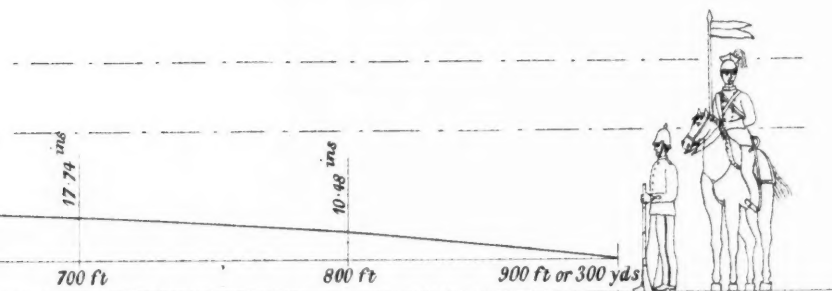
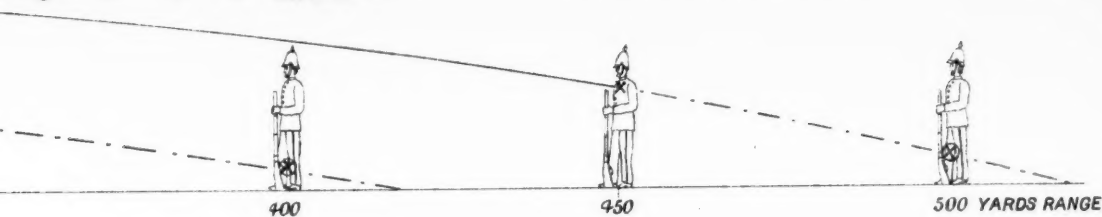


MILITARY RIFLES.

TRAJECTORIES AT 500 YARDS RANGE.

Scale { Height, 5 feet
Range, 75 feet } = 1 Inch

The x denotes the point aimed at.
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Friday, June 18, 1886.

MAJOR-GENERAL SIR PETER S. LUMSDEN, G.C.B., C.S.I.,
Bengal S.C., in the Chair.

ON THE USE OF PETROLEUM AS FUEL IN STEAMSHIPS
AND LOCOMOTIVES, BASED ON ITS EMPLOYMENT IN
THAT WAY ON THE CASPIAN SEA AND IN THE
TRANS-CASPIAN REGION.

By Colonel C. E. STEWART, C.B., C.M.G., C.I.E., Bengal
Staff Corps.

Colonel STEWART: I have just returned from Baku, on the Caspian Sea, where I was employed by the London Chamber of Commerce and the Petroleum Association to attend a Conference on the subject of petroleum that had been assembled at Baku by the Russian Government. I am perfectly well aware that experiments have been made, and successful experiments too, on the use of petroleum as fuel in England, but my remarks are based entirely upon what has been done in Russia. The Russians have advanced beyond the experimental stage, and have actually used petroleum fuel in a very large measure in their mercantile marine and navy.

THE subject of the paper which I am about to read to you is one in which I have been much interested for many years. I visited Baku, on the Caspian Sea, the headquarters of the petroleum industry of Russia, first in 1866, twenty years ago. I then carefully inspected the petroleum refineries, which at that time were only two in number, though now they are nearly one hundred. In 1866 there were very few railways in Russia, and the difficulty of reaching the Caspian Sea was considerable. On that occasion I spent six months' furlough from my regiment in India in riding from the Persian Gulf to the Caspian Sea, and, after visiting Baku, went up the Volga to the fair at Nijni-Novgorod, and then travelled to England by Moscow and St. Petersburg. At present this is a very easy journey, often adopted by travellers from India, but at that time it was by no means so easy.

A trip from London to Baku can now be taken without any difficulty by rail to Odessa and then across the Black Sea to Batoum, and from Batoum to Baku *via* Tiflis by railroad. Otherwise by rail to Vladikavkaz at the foot of the Caucasus, then by diligence over the Darial Pass to Tiflis, then by train to Baku. This is the quickest way, and can be accomplished in ten days, while the journey by Odessa takes at least eleven. Another road is by rail to Zaritzin, on the

Volga, then down the Volga to Astrakhan by river steamer, and then on to Baku by Caspian Sea steamer. I have visited the petroleum districts of Baku nine times during the last twenty years, and have travelled not only by all these three routes, but by several others which are not so short.

On my first visit to Baku the Russian steamers on the Caspian burnt coal, which was most expensive, and this was eked out by using a composite fuel, which was composed of coal-dust mixed with petroleum refuse and shaped in a mould. The quantity of this fuel that was available was small, as the amount of coal-dust procurable was limited. Several efforts were made to burn either crude petroleum or else astatki, which is the refuse left after the more volatile oils have been distilled off from crude petroleum. The first efforts in this direction were not successful, but the difficulties were finally overcome, and for the last twelve years astatki has been burnt in most of the steamers running on the Caspian Sea or the Volga River. I have no exact return of the number of vessels in which astatki is used on the Volga and Caspian Sea, but the number, including small tugs and steam launches, cannot, I believe, be put down at less than 200. All factories and refineries at Baku, which are very numerous, being nearly 100 in number, burn astatki as fuel for the heating of their steam boilers. The small steam-engines working the 157 wells which at present produce oil in the neighbourhood of Baku are also all heated either with crude oil or astatki. Besides this, the very numerous factories at Zaritzin and other places on the Volga use this fuel, and also some factories at Moscow, and at least one at St. Petersburg.

On the Trans-Caucasian Railway the locomotives use astatki, as do also the locomotives on the Zaritzin-Grazi line, having its terminus on the Volga. The locomotives of the Trans-Caspian railroad from Michaeloff, on the Caspian, to Merv, also burn nothing else, a million poods, at 36 lbs. each pood, having been supplied last year for the use of this railroad. The cleanliness and safety of petroleum refuse as fuel has been abundantly demonstrated, and I have only heard of one accident, where a fireman was much burnt in trying to cleanse the pulverizer of a steam-engine which had been choked while the pulverizer was in actual use, and this was due to carelessness on the fireman's part.

Great ignorance seems to prevail in England in regard to the petroleum refuse burnt in Russia under the name of astatki, and extraordinary ideas as to its inflammability seem to prevail. Of course crude petroleum as taken from the well is a highly inflammable substance, and would be dangerous to burn on board ship. I will therefore proceed to describe exactly what is known in Russia as astatki. When the crude oil is taken from the wells at Balakhana, situated some 8 miles from the port of Baku, on the Caspian Sea, it is first pumped into shallow basins, where it stands for a short time to deposit the sand, with which it is largely mixed. It should not be allowed to stand long, as the heat of the sun causes the evaporation of its more volatile particles, but it should be pumped into closed

reservoirs, and is then delivered by the pipe lines (of which there are twelve belonging to different Companies) to the refineries situated on the Bay of Baku. This crude oil is then run into great iron boilers containing from 200 to 3,000 poods each, and is distilled either by fire alone, or else, which is the preferable method, superheated steam is introduced into the boiler, while the outside of the boiler is at the same time heated by the direct action of a petroleum fire. At first the volatile oils, known under the names of benzene and gasolene, are taken off. These, especially benzene, are highly dangerous and inflammable substances. At Baku most of the benzene is got rid of by running it into the sea, though a small quantity, enclosed in iron casks, is forwarded to Russia by the Volga for detergent purposes. The gasolene is not exported, but is used in the Baku district itself as fuel, especially in iron works. After the benzene and gasolene have been distilled off, kerosene, a much less inflammable oil, is taken off by distillation, and also solar oil, which is still less inflammable. The Baku practice is to consider all oil between 0.780 and 0.860 specific gravity (water being taken as 1) as kerosene. This is a much higher specific gravity than American oil. The distilled oil having a specific gravity between 0.860 and 0.880 is known at Baku as solar oil. All refuse having a higher specific gravity than 0.880 is run off into the *astatki* or refuse tank. This is the substance adapted for burning in locomotives and in the furnaces of marine boilers, and should alone be used. Some Russian *astatki* has a specific gravity of 0.910, and occasionally even higher.

It will be observed how much of the inflammable portion of the original crude petroleum has been taken off, and thus *astatki* can be carried with perfect safety in the hottest climate. The burning point of ordinary Baku *astatki* is about 422° F.

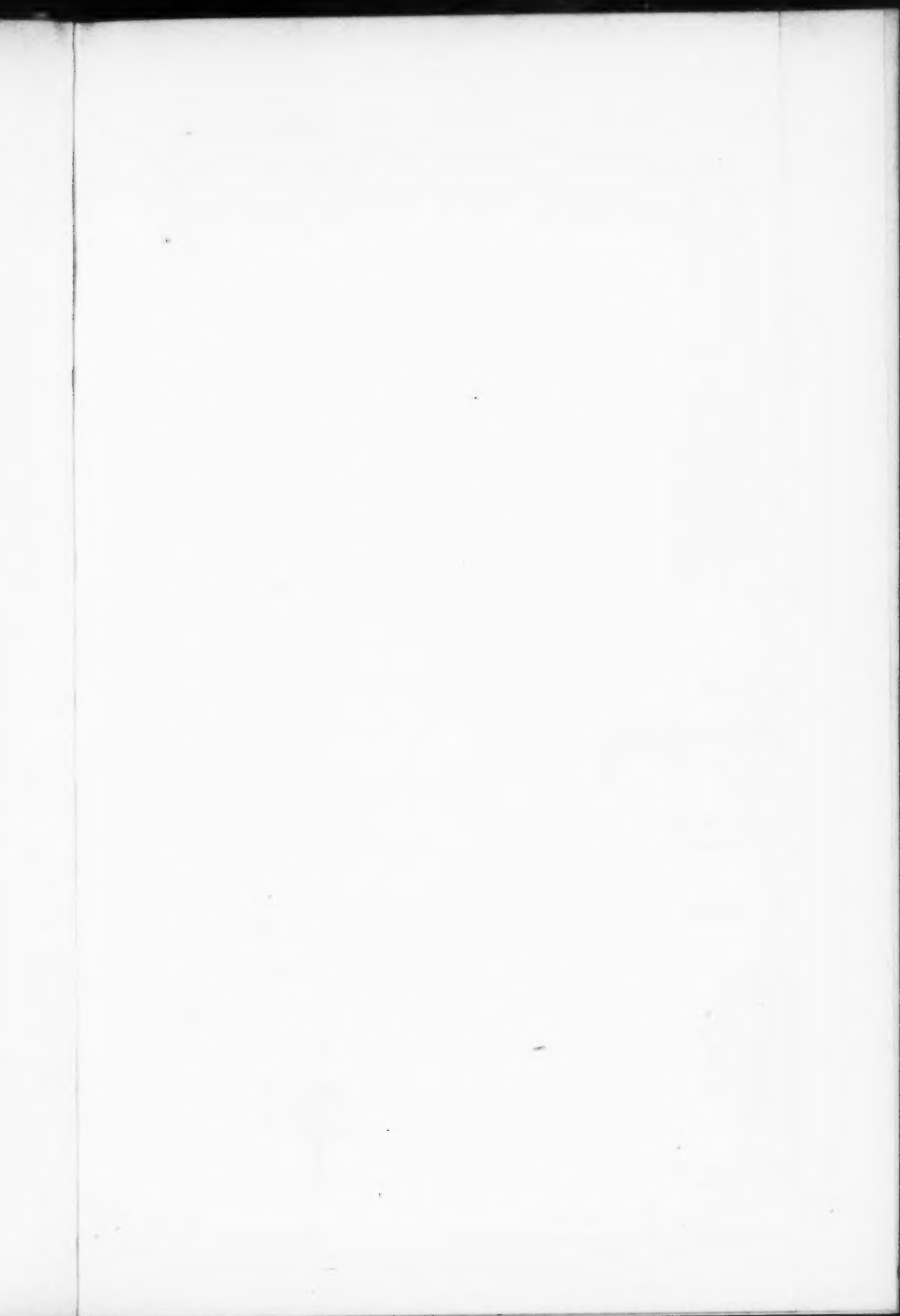
A very reprehensible practice obtains with the more unscrupulous dealers. If they have a flowing well and the quantity of petroleum thrown up by it has been more than they could either refine or sell, and the crude oil has remained some time exposed to the air in the lakes or ponds which surround the wells, and has from long exposure become unfit for refining, they run this crude oil, which is known as lake oil, into their *astatki* tank. As crude oil contains a large proportion of volatile oils, this practice is most objectionable. It is, however, easily discovered by a very simple test, and the taking on board a steamer of *astatki* thus adulterated can be guarded against.

Besides this adulteration by the mixture of crude petroleum with the legitimate *astatki*, another adulteration not so objectionable takes place by the admixture of a substance known in Russia as *gudron*. *Gudron* is the residue when *astatki*, which has already given up its more volatile oils, is again mixed with superheated steam and redistilled and made to yield three descriptions of lubricating oils of different specific gravities. The lightest is generally known as spindle oil, then machine oil, and, thirdly, cylinder oil. This last has a specific gravity as high as 0.925. This second residue or *gudron*, having lost so much of its oily constituents, is much less inflammable than ordinary *astatki*, and it is a common practice at Baku to mix

10 to 15 per cent. of gudron with the astatki sold for burning purposes. There is not the same objection to astatki adulterated with gudron as to the astatki adulterated with crude oil. Gudron cannot be burnt by itself, so this mixture is slightly less inflammable than the ordinary refuse; but there is an objection to its use as gudron is very thick and likely to be full of lumps, it is thus apt to clog the pulverizer or burner through which it is driven.

I am aware of the various trials and experiments that have been carried out at Woolwich and at other places in England in the burning of different hydrocarbons as fuel for steam-engines, and also for the heating of iron furnaces, but I wish here strictly to confine myself to what has been accomplished in Russia, because it has been more widely used there than elsewhere with most excellent results. In 1870 a steamer called the "Alexi" was fitted with an apparatus for burning astatki, and was most successful. Mr. Lentz, a very celebrated engineer, who has at present large works at Baku, over which he kindly conducted me, had about the same period invented an improved burner, or pulverizer as it is always called. Mr. Lentz took out a patent for his improved burner, and this, or a modification of it, is now almost universally adopted in steam-engines and locomotives in Russia. I now produce to you the most simple form of burner which is used at Baku. Through a straight pipe ending in a slightly flattened orifice a jet of steam is driven: astatki is allowed to flow from a small tank through a curved pipe and to meet the steam which pulverizes it or divides into fine spray. This fine spray of mixed steam and astatki is driven by the force of the steam jet into the furnace in which a fire of wood or cotton waste has already been kindled. This fire is continually fed by a spray of mixed steam and astatki. It will be observed that it is requisite before starting a steam-engine by this method to get up steam with either a wood or coal fire to supply the steam necessary for using the pulverizer. Of course this is an objection, but it is one that is easily overcome. At Querelle, on the Trans-Caucasian Railroad, where there is a large engine-shed over which I was kindly taken by the engineer in charge, the locomotives which have brought the trains over the sharp gradients higher up the line are changed and fresh engines supplied. As many engines are always ready in waiting, the difficulty of starting the fire is surmounted by one engine always keeping up steam ready to supply the quantity necessary for utilizing the astatki burners, but it would be easy to supply the necessary steam from a small stationary boiler. When borrowed steam is used for starting a locomotive a special arrangement for the transmission of the steam from the locomotive supplying it in the first instance to the injector of the supplied engine has to be added, but this is attained by a very simple apparatus which I need not here describe. I was informed that a pressure of 120 lbs. of steam can be obtained from cold water in about fifty minutes from the first application of steam to the pulverizer, and in about half that time when it was only necessary to raise steam in boilers already containing hot water.

In marine boilers on the Caspian Sea steam is originally got up by



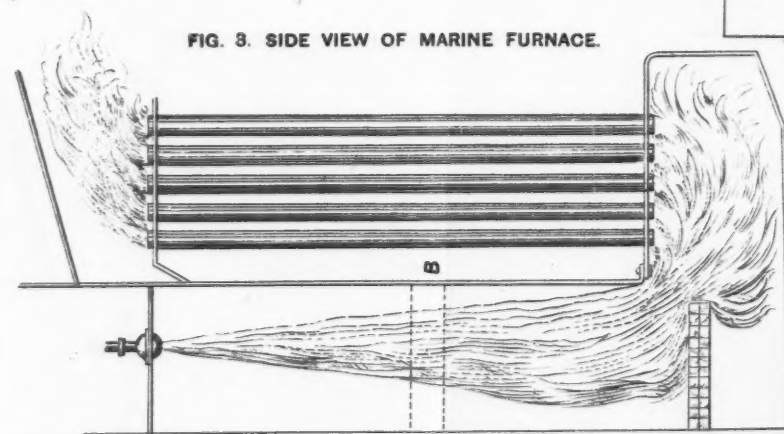
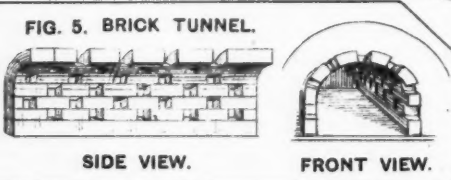
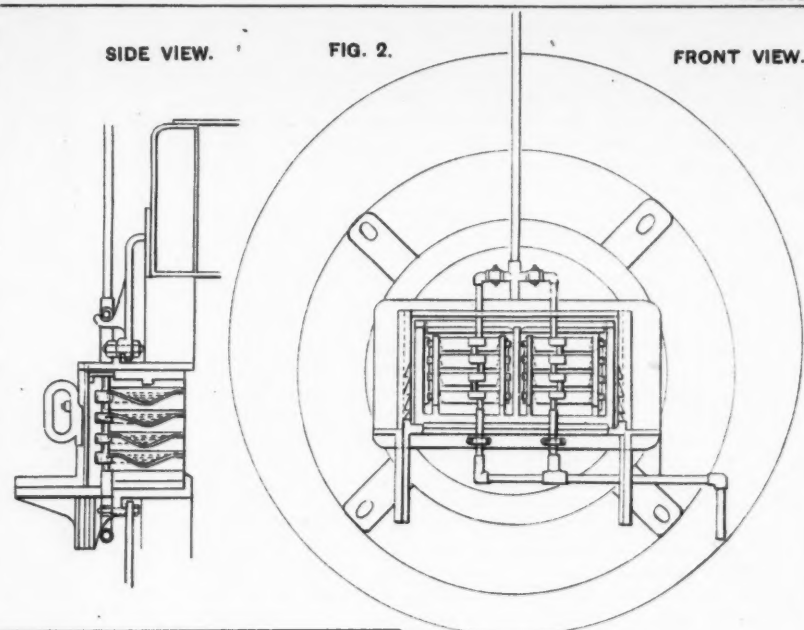
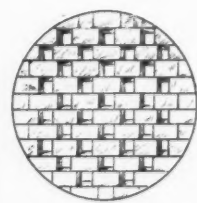
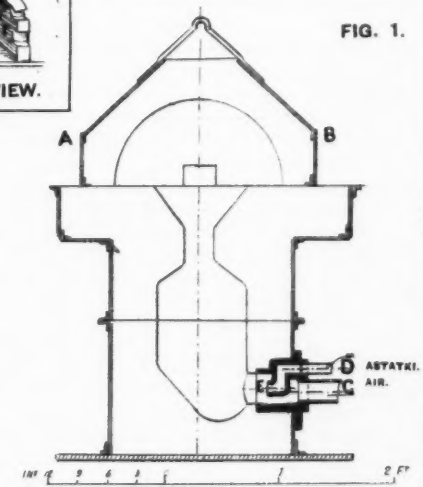


FIG. 4. FRONT VIEW.



VERTICAL FIRE-BRICK PARTITION IN CENTRE OF FURNACE AT A. B. IN FIG. 3.



lighting a wood fire which is dispensed with as soon as the necessary amount of steam for utilizing the pulverizer has been obtained. Thus it is only at the commencement of a voyage, when steam has to be got up, that any fuel except astatki requires to be used.

The advantages claimed by the Russians in using astatki beyond that obtained by the use of the best coal or even of other hydrocarbons than astatki are as follows:—That the caloric power of astatki is greater than that of any other fuel; that its manipulation is very simple, and that it can be used with complete safety. Thus it is a most convenient and, for them, inexpensive fuel. The price at which it can be delivered, either in tank wagons at Baku railway station or on board vessels in the bay at Baku, does not exceed two shillings and sixpence per ton, and has sometimes been even less than that sum.

Mr. Urquhart of the Grazi-Zaritzin Railroad, on whose line astatki has been used for several years with the most complete success, and who is a great authority, states as follows:—

"Comparing naphtha refuse with coal, the former has a theoretical evaporative power of 16·2 lbs. of water per lb. of fuel, and the latter of 12·2 lbs. at an effective pressure of 8 atmos., or 120 lbs. to the square inch; hence petroleum has weight for weight 33 per cent. higher evaporative value than anthracite. Now in locomotive practice a mean evaporation of from 7 to 7½ lbs. of water per lb. of anthracite is about what is generally obtained, thus giving in the case of coal about 60 per cent. of efficiency, while 40 per cent. of the heating power is unavoidably lost. But with petroleum an evaporation of 12·25 lbs. is practically obtained giving $\frac{12\cdot25}{16\cdot2} = 75$ per cent. efficiency.

Thus, in the first place, petroleum is theoretically 33 per cent. superior to anthracite in evaporative power; and, secondly, its useful effect is 15 per cent. greater, being 75 per cent. instead of 60 per cent.; while, thirdly, weight for weight, the practical evaporative value of petroleum must be reckoned as at least from $\frac{12\cdot25-7\cdot50}{7\cdot50} =$

63 per cent. to $\frac{12\cdot25-7\cdot00}{7\cdot00} = 75$ per cent. higher than anthracite."

We may thus consider that 1 ton of astatki is equal in practical efficiency for steam generating purposes to about 1½ tons of the best anthracite coal when steam is used for mixing with it in the pulverizer, but it is quite allowed by both Mr. Lentz, the celebrated Russian engineer, and by Mr. Nobel, another great authority on this subject, that though it is cheaper to use steam as the pulverizer, better results are obtained by a jet of air instead of a jet of steam—an apparatus in the nature of a Roots' blower being used for the jet instead of steam. At Mr. Lentz's ironworks at Baku I saw such an apparatus in practical operation for heating large forgings. I here produce a drawing of the furnace in question (Fig. 1, Plate XXV). A blower driven at a very high rate of speed—3,500 revolutions per minute—drives a current of air into the bottom of the furnace through the opening

at C, where it meets a tube, D, E, containing either astatki or else some of the more volatile oils extracted from petroleum. At Baku both gasolene and solar oil being waste products which must be got rid of, are largely used in the ironworks,¹ but it would be of too inflammable a nature for use either in locomotives or marine engines; a similar result is, however, obtained with astatki. The jet of mixed air and gasolene introduced rises to the top of the furnace where it is lighted. This causes a most intense fire, and forgings of considerable size are soon heated to any degree that may be required. A, B is merely a loose iron cover which is placed over the furnace to retain the heat, and is removable at pleasure.

Mr. Nobel, who is the largest refiner of petroleum at Baku, has also an iron foundry at that place. I saw a cylinder for condensing water weighing considerably over a ton that had recently been cast; the fuel employed was astatki. I was present when several castings were made, and saw about half a ton of pig iron reduced to a liquid state in about an hour. Mr. Nobel employs an apparatus in this furnace in which no steam is used, and a strong natural draught of air is utilized in burning the petroleum refuse. The apparatus consists of a series of shallow troughs placed one above the other at the mouth of the furnace, the burning astatki being made to run through a small connecting pipe from the highest to the lowest series of troughs. I here produce before you some of these troughs, and a drawing of an improved apparatus of this sort (see Fig. 2 in diagrams; side and front view is given). With this apparatus the practical result obtained is much better than when steam is used as an injector; 14½ lbs. of water were actually vaporized by 1 lb. of fuel, and it is hoped that even somewhat better results may be obtained; so that we may consider that a ton of astatki used with this trough burner is in practical efficiency equal to nearly two tons of coal.

I will now proceed to consider the question of the quantity of petroleum fuel available in South-Eastern Russia for use in locomotives and marine engines. At Baku there are at this moment 157 wells yielding oil. Of these some twelve are springing wells, which, when in action, throw a column of petroleum into the air to various heights, sometimes only to a few feet above the level of the ground, and others on some occasions throwing a vast column of petroleum into the air to a height of nearly 200 feet. A well at Bibiabad, near Baku, which I visited, belonging to a Tartar whose name has been Russianized into Tagieff, when it was first bored was for a considerable time a springing well. It threw up at the rate of 250,000 poods of 36 lbs. each a day for nine days. A reservoir had been constructed capable of containing 500,000 poods, but after this was filled, the remainder flowed into the sea, and thus more than a million of poods were wasted. At the end of nine days it stopped flowing for a time, but for many weeks it continued to be a flowing well at intervals. At present it is no longer a flowing well, but a pumping well, and produces 10,000 poods a day. The level of the oil in this well was 82 sagues or Russian fathoms of 7 feet each, when

¹ Gasolene was the fuel used when I saw this furnace in use.

the pumping was commenced last year; and though pumping has been continued for a year at the rate of 10,000 poods a day, the level of the oil has not fallen and still stands at 82 sagines.

At Baku ordinary pumps are not used, as the oil is so mixed with sand that the valves of the pump would be very soon destroyed. Instead of this, a valved tube somewhat similar to a sand pump is lowered into the well and drawn up when full by a long rope, worked by a small steam-engine. This tube varies in size and brings up from 15 to 20 poods at each lift. The time required for each operation varies according to the depth of the well, but the one I am especially referring to, used in a well 82 fathoms in depth, was raised and emptied by the steam-engine six times in every five minutes. Some of the flowing wells at Baku have produced enormous quantities of oil, equalling anything I have heard of as produced by a single well in America. The well at present considered to yield the largest quantity of oil at Baku belongs to an Armenian named Awakoff. It is said to have flowed at first at the rate of 300,000 poods a day, but Mr. Nobel has one or two wells which almost, if they do not quite equal it; both his No. 18 and No. 23 having been flowing wells of the very first class. In the neighbourhood of Baku, viz., at Bibiabad, Balakhana, Surukhana, and Binagudi, some 344 wells had been bored up to September, 1885, the latest date to which I have a return. A few more have since been bored. On that date 142 of these wells were giving oil, and 19 new wells were in progress. I believe the number now producing oil is about 157. From these wells last year 103 millions of poods of crude oil were extracted, which is more than 1,690,000 tons, and last year the output was as much restricted as possible in consequence of the very low price ruling for crude oil and its products. The wells are closed with a sliding valve to prevent their flowing at inopportune times, but they very often burst through all restraints. While I was in Baku in April and May last, on several days a well belonging to Messrs. Palaschkowsky, much against the will of its owners, threw up 100,000 poods a day. It is impossible to sell or refine the very large quantities produced by these springing wells. I only mention these facts to show that an almost unlimited supply of petroleum is available at Baku, and if a brisk demand arose, the supply could be greatly increased beyond what was obtained last year.

It must be remembered that besides the supply available from Baku, there are large deposits of petroleum near Novo Rassisk and Taman, on the Black Sea coast, while some petroleum is found near Kertch, in the Crimea. The quantity of refuse fit for burning produced at Baku is very much more considerable in proportion to the crude oil there found than it is in America. In America something like 70 per cent. of kerosene is obtained from the crude oil, while at Baku not more than 30 per cent. of kerosene is obtained, leaving a residue of 70 per cent. of astatki fit for fuel. Also in America the residue is used for other purposes than fuel, viz., for the production of anthracene, naphthalene, and benzol, so that the quantity of residuum available for burning is not comparatively nearly so great as at Baku. Having

shown that the quantity of crude oil that would be available at Baku and at Novo Rassisk is likely to exceed any probable demand for many years, I will now proceed to consider the question of cost relatively to coal. I am prepared to allow that Russian astatki cannot be used as fuel in England at a price which would enable it to compete with coal, if the question of cost alone was considered and all other advantages placed out of sight; but even if the question of price is alone considered, I think astatki could be delivered in Egypt, at Malta, at Cyprus, and especially in the Red Sea, at prices very little above that of coal, allowing that 1 ton of astatki is equal to $1\frac{1}{4}$ tons of coal in steam-generating power. The price of astatki at Baku is at present about 2s. 4d. to 2s. 6d. a ton, but as it has to be carried in tank cars to Batoum, on the Black Sea, a distance of over 500 miles, the price delivered on board ship at Batoum at the present time is about 25s. a ton, while at Novo Rassisk it can be procured at about 22s. The quantity, however, procurable at Novo Rassisk, though considerable, would soon be exhausted if a large demand arose.

If a pipe line were constructed from Baku to Batoum (a project which is at present under the consideration of the Russian Minister for Crown Domains), the cost of transport would be considerably reduced, and it could then probably be delivered on board ship at Batoum at about 17s. per ton. If conveyed in tank steamers, the cost of transit to Egypt or Malta would not be great, and it could then compete at those places very successfully with coal. Among the advantages which astatki has over coal may be mentioned that the stowage space required is rather less than that required for coal, and that it can be stowed in spaces that would not be available as coal bunkers, viz., in the tanks usually filled with water ballast. Besides these there is the great advantage of cleanliness; there is no ash or refuse of any sort to get rid of, and it requires no stoking or attention. In fact Russian steamers running from port to port on the Caspian Sea, after having started their fires, these practically require no attention till the end of the voyage, and thus the services of stokers are almost dispensed with. On the Caspian Sea steamers only such a number of men are employed as are necessary to keep the machinery clean. An engineer is of course necessary to watch the steam, &c., but the firing really requires no attention. A properly arranged astatki fire is also almost, if not quite, smokeless. Plenty of smoke can be seen issuing from the chimneys of the older refineries at Baku, but this is sheer carelessness and waste. In the White Town, near Baku, where the newer refineries are situated, and especially at the factory at Novo Rassisk, where a good system of burning is adopted, there is hardly any smoke. The appearance of smoke is a sign that a waste of fuel is taking place, and is at once obviated by a slight adjustment of the pulverizer, or a small change in the draught. I need not point out how great an advantage it would be in action to have no smoke from the furnaces, and though I am aware that when Welsh coal is used the quantity of smoke is considerably reduced, still the smoke produced, even by the best Welsh coal, is very much greater than in a properly arranged astatki furnace.

At Baku differently arranged furnaces are used in the marine engines, but the most usual and the most simple is the following. When it is proposed to convert a coal-burning furnace into an astatki-burning furnace the fire-bars are taken out, as they are no longer required, and a vertical fire-brick partition is built about the centre of the furnace (*vide* Fig. 4). This fire-brick partition has many openings in it, each opening being the size of one brick, the openings are left for the passage of the flame through the partition. This brick division retains the heat, and cannot well be dispensed with. A low brick wall is also sometimes placed at the end of the furnace. An alteration has also to be made in the door of the furnace for the admission of the pulverizer, and for the regulation of the draught, a stronger draught being required in burning astatki than in burning coal. A diagram is here shown of the furnace of a Baku marine engine (Fig. 3). A small tank containing petroleum has to be placed in such a position that the astatki shall be readily supplied to the burner. This tank is filled from the main petroleum tanks. All the alterations for the conversion of a coal-burning furnace into an astatki-burning one can be made in a few very days, and the re-conversion of an astatki-burning furnace into one burning coal is very much simpler. It is only necessary to take the brickwork out of the furnace, replace the firebars, and put in a new door; in fact the alterations for this re-conversion could be carried out in one day if necessary. A great many of the furnaces of the steamers on the Caspian Sea and on the Volga were originally constructed to burn coal, and have been converted to their present use, but where a furnace is specially constructed to burn astatki, it has been found that better results are obtained if the boiler tubes are made longer and of less diameter than in a boiler intended for use with coal, and the same remark holds good for locomotives in which astatki is used.

In furnaces of land boilers, the space being larger, it is usual to reduce it by building a fire-brick tunnel with many openings in the interior of the furnace. At Novo Rassisk I was present when a land boiler used at some Portland cement works, in grinding the cement, was converted from a coal-burning furnace to an astatki-burning one. The boilers were ordinary cylindrical boilers below, with tubular boilers above, and had been constructed by Borsig, of Berlin. Great difficulty had been found when coal was used, unless it was of the very best quality, in obtaining power enough to drive the grinding mill, but with astatki no such difficulty occurred. I here show a diagram of a section of the brick tunnel in this furnace, and also a side view of it (*vide* Fig. 5). I know of one marine engine which has this brick tunnel in its furnace.

Besides the steamers on the Caspian a few on the Black Sea now burn petroleum. Mr. Tweedie, an English merchant of Odessa, has had some of his vessels running on the Black Sea converted so as to burn astatki, and I believe proposes to convert the whole of his fleet in a short time. In England two or three vessels are building intended to burn petroleum; one at Messrs. Armstrong's works, on the Tyne, and one or two more elsewhere. These will not only burn petroleum,

but are tank steamers especially constructed for the carriage of petroleum and its various products. On the Caspian Sea there are a number of tank steamers, many of them belonging to Messrs. Nobel, but also some to other Companies, which are constructed for carrying petroleum, but they are not intended for long sea voyages. A tank steamer called the "Svet," has been built at Mothala, in Sweden, specially for the carriage of petroleum products on long sea voyages. Two more are being built at the same place for the Russian Black Sea Company. In the Caspian tank steamers the skin of the ship itself forms the outside of the tanks, but in the "Svet" the tanks are quite separate from the sides of the vessel. I have heard within the last few days that there is some probability of the "Svet," which is now at Gibraltar, bringing a cargo to London, and an opportunity may thus occur of examining her. A vessel constructed to burn petroleum refuse was, I know, launched in England in March or April last.

Another great advantage that *astatki* has over coal is the facility of taking in a cargo. All of us must remember the disagreeables of coaling and the utter discomfort caused by it. Everything in the vessel is covered with a grimy coat of coal-dust, but with the cleanly *astatki* none of these horrors have to be endured. A connection is made through a pipe from the shore to the steamer requiring a cargo of *astatki*, and it is pumped into the tanks on board at the rate of 100 tons an hour by a steam pump. At Baku 800 tons of petroleum are placed on board a steamer in eight hours. If a vessel required a very large cargo of *astatki*, by using several pipes she might fill several tanks at the same time, thus reducing the time necessary for taking on board her cargo of fuel.

I have heard two objections made in England to the use of petroleum as fuel: first, that it is highly inflammable and dangerous in use. I have shown that this objection is groundless in the case of *astatki*, which is by no means so, though crude petroleum is highly inflammable, but no one would propose to burn crude petroleum in marine furnaces. The flashing point of *astatki* is from 316° to 322° , and the burning point is about 416° to 422° . A good deal of confusion is caused by people not understanding the difference between the flashing point and burning point of mineral oils. The flashing point is when such a temperature is reached that the oil gives off gas but does not itself burn. I produce before you a machine that is used for testing kerosene oil, and I will show the difference between the flashing point and the burning point, and you will see that even when the kerosene attains the flashing point and a light is applied, it will not burn, a far higher temperature is required for that. I should have liked to have carried out this experiment in your presence with *astatki*, of which I here produce a sample, but the flashing point and especially the burning point of *astatki* is so high that I should have considerable difficulty in a place like this in obtaining the necessary heat to raise it to its burning point. I, therefore, show the experiment with kerosene which has a low flashing and burning point.

The other objection made to its use is that it could not be procured in sufficient quantities at a reasonable price. I have endeavoured to show that millions of tons of it could be procured even now at a price by no means placing its use beyond the reach of competition with coal in the Mediterranean and eastern seas. When the pipe line from Baku to Batoum is laid down the price will be so much lowered that it will easily compete with coal in all countries where coal is not a home product, and the advantages attending its use which I will here recapitulate are so great that except in the question of price coal could not enter into competition with it at all. Firstly.—Astatki requires rather less room than coal for its stowage. Secondly.—It can be stowed on board vessels in spaces that could not possibly be availed of for coal, for instance, between the inner and outer bottom of a ship. Thirdly.—It is cleanly in use, there being no cinders or ashes. Fourthly.—It almost does away with the necessity of a fire crew beyond the number necessary for cleaning the machinery and superintending the steam. Anyone who has watched stokers at work in the hold of a coal-burning ship in the hot weather in the Red Sea would appreciate the advantages of doing away with all stoking. Fifthly.—The great facility of loading is an enormous advantage, and the absence of smoke is by no means its least good quality.

It may be objected that we could not trust to Russia for a supply of petroleum for our ships in case of war, but for the present petroleum refuse could be procured from Russia, and it is a product which is found in so many countries that if there was a demand the supply could be obtained from many other lands. Besides the supply procurable from America, Upper Burmah, which happily is ours, can give us large quantities. It has been found in India, and some is actually being used experimentally on the railway in that country, while its discovery on the western coast of the Red Sea, it is believed in considerable quantities, is a point of great importance. Petroleum can also be obtained from Australia. I think that petroleum will eventually be discovered in the Persian Gulf and on the Beloochistan coast, as mud volcanoes are numerous in that part of the world. In the Caucasus mud volcanoes are looked upon as almost a sure indication of petroleum. I do not here refer to the hydrocarbons produced in England, as I fear the price might be too high if a large demand arose.

I wish most earnestly to bring to the notice of our naval authorities the advantages a Russian war vessel burning petroleum would have over our vessels burning coal. In case of war a fast Russian war vessel having on board, say, 1,500 tons of petroleum, could keep at sea for a very long period, and do our shipping interests incalculable mischief. She would probably be captured when her supply of petroleum fuel was exhausted, but it would be well worth Russia's while to lose a ship after all the mischief she could accomplish during the time her supply of fuel was available. Vessels burning coal would have a very bad chance of capturing her as long as her fuel lasted, as they would require to replenish their supply long before she would require to do so, and it is not even quite certain that she

would be helpless when her supply of astatki came to an end, for it would be quite possible if she could procure a supply of coal to alter her furnaces in a day or two so as to burn that fuel.

The very great advantage that would be obtained by torpedo-boats burning astatki over torpedo-boats burning coal I need hardly point out. In these small vessels a hydrocarbon like astatki, whose steam-generating power is nearly double that of coal, would give the boats using it an immense superiority, to say nothing of the advantage gained by their power of approaching the enemy at night unseen in consequence of the almost entire absence of smoke.

It should be our object to have a supply of astatki stored for the use of our vessels at different points in the Red and Mediterranean Seas and Indian Ocean. If we had large reservoirs containing astatki in Cyprus, at Malta, Gibraltar, Aden, Ceylon, Singapore, and Hong Kong, our vessels, both of the mercantile marine and Royal Navy, which need that fuel would have an immense advantage over the ships of any nation burning coal.

MR. EDWIN HENWOOD: Mr. Chairman, ladies and gentlemen, I have much pleasure in stating that as far as the burning of petroleum has been carried out under my patent system it is a most perfect success. I fitted it to a steamer last year on the Thames and have had her running now for some months. It has been seen by several people and very highly approved of. There is not a particle of smoke, and when the petroleum is properly burned there is nothing to be seen in the brightest sunshine except a transparent gas through which you cannot even look at the sun. The advantages of storing are enormous, and the amount of evaporation obtained under my system is such as to surpass coal by over four times, so that in the case of torpedo-boats and for vessels going long distances there can be no question whatever as to the enormous advantage that a vessel so fitted will have over others. In addition to that the boilers can be constructed of smaller dimensions, and in many ways rendered more efficient by having smaller diameters, less thickness of plating, and higher pressures. The steamer that I have had on the Thames is one of 120 tons with old-fashioned engines, and the rate of consumption we find to be under most careful testing only $\frac{1}{4}$ lb. of fuel per horse-power per hour. With a compound engine or a triple or quadruple expansion engine the consumption I believe will not be found to exceed $\frac{1}{4}$ lb. of fuel per horse-power per hour.

MR. BOVERTON REDWOOD: The subject of the use of astatki as liquid fuel has been so well treated this afternoon by Colonel Stewart that I feel that one cannot with advantage add very much to what he has said as to the details of various methods employed in using that fuel in Russia, but as I am practically acquainted with the petroleum industry of Russia as well as with that of the United States, I may perhaps be allowed to speak on one or two of the points which Colonel Stewart has alluded to. In the first place, as to the very important point of the productiveness of the Russian petroleum fields and the amount of petroleum which the world is likely to be able to obtain from Russia, I think there can be no doubt whatever that the matter may be regarded as very much on the same footing as the question of coal supply; that is to say, although it may become an important question for succeeding generations, it is not one which we need address ourselves to with any great seriousness. I was practically acquainted with some of the most productive wells of the United States before I paid a visit to the oil-fields in Southern Russia, but I was wholly unprepared for the evidence I there saw of the enormous productiveness of the Balakhani-Saboontchi field. I had an opportunity of seeing one of the spouting wells referred to by Colonel Stewart opened, and I certainly was very much impressed with what I saw. Immediately upon the slide being drawn there was a gigantic column of oil about one foot in diameter thrown up to a height of over 100 feet, and to a still greater elevation one could see large stones being pro-

jected, exhibiting the force with which the oil was being discharged. In point of fact a pressure gauge applied to some of these wells has indicated something like 200 lbs. to the square inch. Colonel Stewart has said that he is not aware that there are any wells in the United States more productive than some of these flowing wells in the Baku district. He might certainly have put the case more strongly, because there is no doubt that the most productive well in the United States has yielded in 24 hours only $\frac{1}{4}$ th or $\frac{1}{5}$ th of the quantity estimated to have been discharged by some of these flowing wells in the Baku district. As regards the use of astatki as fuel, I should like to say just a word in praise of the results which have been obtained by Mr. Ludwig Nobel in the use of the "trough" burner, one of the forms of which arrangement is on the table before you. I found the arrangement in question being used for metallurgical purposes in St. Petersburg, and although that is perhaps a little foreign to the subject we are now considering, yet as indicating the amount of heat which can readily be obtained by the use of liquid fuel, I may mention that I saw pure, soft iron brought into a state of limpid, liquid fusion, in fact so limpid that small spanners and other articles were cast without the least difficulty. I hardly believed that the iron could be pure, because as we all know while the melting point of cast iron is comparatively low that of pure iron is very high indeed, and in order to show me that the iron was as soft as was contended, an engineer took one of these castings and, after it had been allowed to cool, bent it into the form of a flattened letter S under the steam hammer. The metal did not show the smallest sign of fracture, indicating how malleable it was. As regards the question of the supply of this liquid fuel at Batoum, Colonel Stewart has pointed out that by the construction of a pipe line the astatki can be supplied on the shores of the Black Sea. But although it will no doubt be necessary to have some better method of transport than is afforded by the present Trans-Caucasian railway, which passes over a gradient of 1 in 22 in one place, yet I think we can hardly hope in the first instance to get all the results from a pipe line which Colonel Stewart has, as I am afraid rather sanguinely, anticipated. I am not aware that it is proposed at present to lay more than one line, and that being so it will only be available for the transport of one class of material. The proposition, as I have had it put before me, is to use the line for the transport of burning oil, which after all is the material which has up to the present time attracted the greatest amount of attention, being that which finds the readier market, and the only method in which one pipe could answer for the transport of the various products would be by transferring the refining arrangements from Baku to Batoum, and transporting the crude oil to Batoum where it would be refined and separated into the various commercial products including astatki. I will only just say one word in conclusion in reference to the various routes to Baku. I am under the impression that in consequence of the very interesting nature of the tribes inhabiting the Caucasus, and the very beautiful character of the scenery, the Caucasus is likely to become a fashionable resort. I believe people do not quite clearly understand how very easily a trip, a trip of the most interesting character, may be made to Baku, going first to Nijni Novgorod, and, instead of taking a train, as Colonel Stewart suggests, to Zaritzin, going down the Volga the whole way from Nijni to Astrakhan, by one of the excellent saloon steamers. One sees a great deal of Russian provincial life which is of great interest, and the journey, although a longer one, affords a good rest to a hard-worked man. Travelling from Astrakhan to Baku, down the Caspian, one has an opportunity of seeing astatki used as fuel on the steamer and watching the manner in which the single attendant, instead of being busily engaged in stoking the furnace, is sitting at his ease and merely regulating from time to time the taps in the pipes which supply the astatki and steam. From Baku one then takes the train to Batoum, but at Tiflis, *en route*, a visit should be paid to Vladikavkaz, which lies amid scenery reminding one of the Alps, though it is grander and more like the scenery which one gets in the neighbourhood of Darjeeling in India. From Batoum I can recommend taking a steamer along the Asia Minor coast to Constantinople, instead of going to Odessa. One thus has an opportunity of landing at Trebizond and other places well worth seeing. The whole round constitutes a trip which may be easily made in less than three months, and which is very full of interest.

Admiral Sir ERASMUS OMMANNEY: In constructing engines to burn this fuel I should like to know whether any space is gained owing to their being smaller than the ordinary engines.

Admiral SELWYN: I am naturally very much pleased to hear gentlemen coming from a totally different view of the subject to that which I have taken for the last twenty years, so strongly pointing out the advantages to be gained by the substitution of oil for coal, whether it is called astatki or the kind of refuse product which comes very near to astatki in this country, except that it has considerably greater specific gravity, and which we have always used. I have never used oil lighter than the gravity of water, even salt water, but always higher from two causes which I will develop later. I am very much pleased to find at last, after attention has been drawn to the subject for so long a time, that while in this country the first progress was made and has been to the present date continued, other nations are successfully using it with much less maritime interest than we have, and that they have left us far behind, not in the race of knowledge, but in the race of application. I quite agree with all that Colonel Stewart has so ably said as to the absolute necessity of not letting this be the case any longer. I do not propose to enter into what has been done here, though that is of the greatest interest to me, because Colonel Stewart, in his paper, has practically banished that from the discussion, and I wish to speak mainly to points which he has raised, and those points on which I think I can perhaps either afford some information or correct some statements which are slightly mistaken. And first with regard to the advantages gained. Now these, of course, are the fundamental facts on which we must go in estimating how far oil can compete with coal, and if they have been mis-stated in any sort of way we should then arrive at false conclusions. In practice in England for many years past we have very largely surpassed anything that Mr. Urquhart or anybody else in Russia has ever done, we having produced an evaporation generally nearly twice as great as they produced there, and sometimes even more than that—I cannot say absolutely at present more than twice as much, but six times as much as can be done with coal. If we take Mr. Urquhart's statements, the figures will all come out far below the actual facts. First of all, I think he has given rather too high an evaporative value to coal. We know in modern days we have had very great claims as to the evaporative power of coal. These have arisen from the fact that we have got more horse-power out of a similar amount of coal, and we have still to lament the fact that when we take the same engine, the boiler being at the same pressure, we still get not more than 7 or $7\frac{1}{2}$ lbs. But is it possible to get very much more than this out of coal? I answer that you never can do very much more than our practice has shown us during the past two centuries, for the reason that the total theoretic value of coal being about 15.75 lbs. of water vaporizable, as shown by the late Professor Rankine, six units are lost in transforming the solid coal into the gaseous state, and two units are lost at 600° F. up the funnel, $15.75 - 8 = 7.75$ theoretically available. You can get an enormous deal more value out of coal by putting a higher pressure on the boiler, but you cannot get a greater evaporative value. Those who propose to do it to-day do it by means of the higher pressure, which gives more mechanical duty arising from a pound of coal, but they do not do it by higher evaporation, that remains the same as it was before. If we take then the real facts with reference to astatki or oil of any description such as would be recommended for use on board ship, that is to say, with the specific gravity passing that of salt water or approaching it, in the case of astatki, as nearly as possible—the specific gravity of astatki being about 910, and that of the oil we burn here from 1,050 to 1,070, we get three times the duty of coal at once and easily, and that without any very special appliances. This affects the whole problem in this way: instead of carrying one-and-a-half times as much fuel on board ship you carry three times as much, so that I am starting now as low as it is necessary to do and far below what I know can be done. The next statement which I wish to notice is that with regard to Mr. Lentz's statement that it is cheaper to use steam as a pulverizer, but that better results are obtained by a jet of air. Now any engineer will understand me perfectly well when I say that if you use air you must produce it by the use of power, that this use of power involves an expenditure of fuel or steam, and therefore until you have deducted whatever you require to make the jet of air available you have not got at the true result of

your evaporation. One of the laws which obtain I think almost universally among engineers is that the more changes power passes through from the raw material to the form in which you use it the less mechanical value you can get out of it. If we use steam to blow in air we find that a jet of steam with a pressure of over 30 lbs. to an inch induces a quantity of air 216 times its own bulk; therefore, the steam used alone does infinitely more than we could possibly expect to do by putting that steam into an engine, using the engine to drive a blower, and thus driving in air. I am now leaving entirely on one side the useful combination of the hydrogen and the steam. 3,500 revolutions a minute cannot be obtained without considerable power, and when you have got it, instead of having steam at the temperature of superheated steam, you have cold air, the nitrogen and oxygen of which have to be raised to the temperature of the furnaces before they can be burned. Therefore, there are two losses which justify all our early practice in 1867. At Woolwich, Mr. Crampton was using air in that year to blow in oil, and he failed on this account, and its use was entirely superseded thereafter in England by the use of steam. The next case is where the oil used is gasoline. You must recollect when you come to gasoline or any of the lighter products of the petroleum oil you obtain a material which, containing as it does more hydrogen, has a larger calorific value, and that if you were to compare it with astatki, whose calorific value never rises higher than 20—I am speaking of the theoretical calorific value—you will find that with gasoline you will rise to 22 and to 24 and in rare cases to 27; therefore, you cannot compare at all the evaporative value with that previously obtained with any useful result. I note also a very curious thing in these days of engineering, that at Baku ordinary pumps are not used because the metallic valves would wear out with the sand. I think the man who does not use leather in a sand-pump does not know that this particular oil is one of the best preservatives of leather ever known; leather will last a wonderful time in it, and leather will not be attacked by sand. It has been used in sand-pumps ever since I was a boy. I should be very sorry indeed to resort to drawing oil out of a well by a tube in the way described. As to the delivery of astatki at Egypt, Malta, Cyprus, and the Red Sea, I have very little doubt that as soon as there is a demand for it the oil can be delivered at a price even below that at which Colonel Stewart has put, and that without any reference to the difficulties of a pipe line. Whenever a commercial operation can be carried out at a profit, the question of what plant you employ becomes a very minor one, and pipe lines sufficient for all purposes can easily be laid down. I cannot join with the previous speaker who said that it would be cheaper to transfer the raw material to a point on the Black Sea at a considerable expense and then distil it. In fact, carrying the raw material at great expense instead of carrying the finished product. I should say that is opposed to all our practice in engineering, mining, and every other way. But even supposing we had no astatki available from Russia, and that we do not rely on foreign sources of supply, is there any difficulty in laying down any quantity of oil coming from England and produced in England at as low a price at any point you like to take it to—Malta, Gibraltar, or any other place in the Mediterranean? Not the slightest. We possess a greater store of oil in the solid form in this country than has ever been obtained either at Baku or in any other country in the world. From Dorsetshire on the south coast to Norfolk on the east we possess beds of shale which give 120 gallons of oil to the ton on distillation, and which are 650 feet thick, and lie within 30 feet of the surface of the ground. This is only what has been ascertained and practically shown. As to what width those beds extend we have no available geological knowledge, but from the Geological Museum I have obtained these facts, and they are patent to the whole world. We can distil that at a price which will probably leave a considerable profit on twenty shillings a ton in this country. There is no difficulty in attaining it either now or in the next ten centuries if you like, and when that time has passed I do not think any of those who are present in this Institution will probably be talking about it or will occupy themselves with any doubts on the question of oil *versus* coal. With reference to the astatki over coal for stowage, Colonel Stewart does not quite give the data. If you take the specific gravity of water to be 1,000, you then calculate 35 cubic feet of space to every ton of water. Coal will occupy 45 cubic feet, whereas astatki being of a specific gravity of 910 would occupy little more space than the water, and the

oil, whose specific gravity rises above that of salt water, will occupy less, *i.e.*, 32 feet while coal occupies 45. Colonel Stewart has also pointed out very properly that this oil can be stowed as no coal could be stowed in places not now utilized, and with much better distribution of weights than we are now obliged to have. Sir Edward Reed drew my attention to the fact that in our modern men-of-war we have very great difficulty in providing for the transmission of coal to the fire, whereas with this oil all these difficulties disappear. Lord George Hamilton lamented the necessity for an army of stokers in the Navy. I must say it seems to me very extraordinary that up to this time, though I have over and over again affirmed it, and Colonel Stewart gives the strongest testimony to the same thing, no change has been made in this direction. I say that no stokers whatever are necessary, not a single stoker is needed on board a ship at all; you do not want coal trimmers, you do not want stokers, you do want men to attend to the machinery, and these men will do all that is necessary, and very little it is, in attending to the fire. In the case of the various systems which Colonel Stewart has shown us adopted for burning this liquid fuel in Russia, I am afraid I cannot recognize any great amount of knowledge, and certainly no advance or improvement over the systems adopted in this country in 1868-69. Then we had the same injector which is now used; then we had the evaporation of 17 lbs. of water per pound of fuel used at Woolwich, the Blue-books show that, therefore I need only refer to them without making any statement about it myself. I quite agree with Colonel Stewart in saying the advantages compared with coal are so great that there is no possibility, where it is once known or used, of coal ever entering into competition with it at all. May I draw attention to one fact connected with that subject? Our modern steamers of high speed, such as the "Aurania," burn 430 tons of coal per day. The result is that almost their whole cargo-space is taken up by that consumable store, and those vessels cannot possibly pay dividends on consumable stores. The result also is unfortunately that only eleven lines of steamers sailing out of the British Islands are able to pay dividends to-day, and those who do pay them are mainly doing it from subsidies of some kind or other. This is a most serious fact which points, if it were allowed to continue, to the extinction of our mercantile marine. Too much attention cannot be drawn to the subject in that way. Colonel Stewart says that "in the Caucasus mud-volcanoes are looked upon as almost a sure indication of petroleum." Before going to Egypt, Mr. Tweddle told me he knew that Penjeh was a point at which these mud-volcanoes were found in the largest numbers, and to which we might well look for the largest supply of oil. I think that explains why Penjeh has been so rapidly annexed. With regard to the few words that Colonel Stewart has said about the Navy, I have long pointed out the same thing. I say distinctly no man-of-war ought to go to sea to-day with the knowledge that there may be another vessel at sea of her own force which can carry, according to Colonel Stewart's idea, 1½ times her amount of fuel, and, according to my idea, about 6 times. He says also that she can resort to coal in the event of her oil supply failing. All I can say is that I can meet a steamer at sea in a given latitude and longitude, and if that steamer is loaded with oil, without any boat-transfer and by means of a simple pipe, I can replenish my own stores of fuel as I tow her ahead. That does away with all the difficulties about coaling at sea and neutral ports. As to the great effect of the liquid fuel on iron and other metallic substances, I am not sure whether I have told the Institution before, but Messrs. Johnson and Matthey have been ever since 1871 using this oil persistently in their furnaces in Hatton Garden for melting platinum. The melting-point of platinum is 3,080°, and Mr. Matthey told me since that, whereas previously platinum was one of the most refractory metals he ever had to deal with, he now finds no more difficulty in melting platinum than he did formerly in melting lead. If that be true, of course the case is very much more so with regard to iron. Mr. Nordenfelt has brought out a metal which is wrought iron entirely melted and cast by the use of these petroleum fires, so I think we have on all hands a consensus of opinion in favour of turning to this as a new fuel with much greater power, much more available, and absolutely essential to our mercantile marine and Navy.

MR. CHARLES MARVIN: Colonel Stewart has described so fully in his admirable lecture the oil industry at Baku, and especially those features connected with liquid

fuel, that it is very difficult for me to add anything of serious importance to his remarks. There are, however, one or two observations which I may make, which may possess a certain amount of value, as confirming what he has said, and may shed a little further light on the subject. Mr. Redwood, who undertook a journey to Baku a short time ago, has described in the most graphic manner how easy it is now-a-days to go to Baku. As a matter of fact, it is so very simple that within the last few weeks two of our tourist agencies in London have made arrangements for taking tourists to Baku. About a fortnight ago Messrs. Gaze left with one party, and I believe in a week or two Messrs. Cook will be leaving with another; so that Baku, which, in 1866, when Colonel Stewart paid his first visit, was really very difficult to get at, has now become almost a pleasure resort to English tourists. The next point I would refer to is the question of the safety of liquid fuel. On that point I think there can be really no room for discussion. On the Caspian and Volga there are over 200 steamers burning liquid fuel. Some have been using it for the last fifteen years; one steamer in particular has made no less than 250 voyages, using liquid fuel, so that taking the whole of those steamers together, probably some thousands of voyages have been made with liquid fuel without, so far as I am aware, a single accident; or, at any rate, without a single serious accident. With regard to the observation dropped by Admiral Selwyn with respect to the probability of there being petroleum at Penjeh, it may be interesting to state that within the last few weeks I have received a letter from the Caucasus stating that very considerable discoveries of petroleum have been made near Askabad and Merv. There are also indications of considerable petroleum deposit between Askabad and Herat, and I should not be at all astonished if the prediction made as to there being oil at Penjeh should turn out to be true. We know that as the Russians have advanced from the Caspian in the direction of Herat they have discovered petroleum at half a dozen different points, while we on our part in advancing from India into Beloochistan have discovered petroleum as far as Quetta. There is, therefore, very great probability that the petroleum chain starting from the Crimea, and running across the mountains to the Caspian, and from the Caspian in the direction of Herat as far as Dushak and Penjeh, also extends beyond again as far as Quetta. These discoveries of petroleum in Central Asia give very great importance to the Russian annexations in that region, but side by side with this the recent discovery of petroleum in Egypt also adds to the importance of our hold upon that country. Colonel Stewart has called attention to the very great value which liquid fuel would be to our fleet in time of war, and I think everybody who is at all connected with the Army and Navy will recognize the advantage of having a large supply of liquid fuel close to the Suez Canal. The crude petroleum which has been discovered in Egypt, and which so far as is yet known does not contain much oil for illuminating purposes, still is very well adapted for liquid fuel, and I have no doubt that once steamers begin to use liquid fuel in the Mediterranean and the East, these petroleum fields in Egypt will acquire very considerable importance. With regard to the observations that were made by Admiral Selwyn respecting Mr. Urquhart, an Englishman in Russia, and Mr. Lentz, who has acquired a great reputation on the Caspian by his liquid fuel inventions, it should be clearly understood that while in this country liquid fuel has scarcely got beyond the experimental stage, in the Caspian Sea it has altogether become common-place and matter of ordinary use. Mr. Lentz, for instance, has been running steamers on the Caspian Sea the last ten or fifteen years, and he has made a number of inventions, and these inventions have not only got beyond the experimental stage but they have been used for years past, giving great satisfaction to the shipowners on the Caspian.¹ Probably those inven-

¹ See the chapter on "Liquid Fuel" in "The Region of the Eternal Fire" (London: Allen and Co., 1884), pp. 258-282, where the history of the various liquid fuel furnaces in the Caspian is given and the operations of Lentz described. Probably, besides 200 steamers, more than 500 locomotives and 800 stationary engines, large and small, burn liquid fuel in Russia; so that the practice is thoroughly established there, while we have not yet got beyond the amateur stage. —C. M.

tions will be improved upon in time, and in that case Mr. Lentz will acquire a greater reputation in this country. But, at any rate, in the meanwhile it should be clearly understood that the statements of Mr. Lentz are based upon actual practice and not upon mere theory at all. There is one very important feature in connection with this liquid fuel in Russia, which I think ought not to escape the attention of English capitalists and shipowners, and that is this: that as petroleum extends itself more and more over Russia, in the Black Sea regions, and also to some extent in the Baltic, English coal will be driven out of the market of Russia. This will naturally seriously affect English enterprise and capital, and I think it would be a good thing in the interests of English trade if that enterprise and capital could be diverted in good time into the petroleum fields belonging to the British Empire. One final word with regard to the pipe line connecting Baku and Batoum. This very important question is so far advanced now that in principle the Russian Government has decided to support any reliable pipe line enterprise submitted to it. The matter is now before the Council of State at St. Petersburg, and the form of concession is being drawn up. Different people have applied for the concession, and the competition will probably not only result in the construction of a line to be employed in the conveyance of kerosene, or lamp oil, but also very possibly may provoke the laying down of another pipe line to convey liquid fuel to Batoum.

Mr. EDWARD FIELD, C.E.: I do not know that I have much to say on this subject, but being an old hand at burning petroleum it may be interesting to know that I began in 1865, and have been engaged in the matter ever since. I have steadily watched the progress of improvements in apparatus for its consumption. It seems to me that petroleum can not only be burnt to do a considerably better duty than coal, but that it can be burnt to do from three to four times the duty of coal at the same cost if properly burnt. All depends on the apparatus which is used in burning. I am not prepared now to go through all the apparatus that has been applied, but as far as I can see there is not a single improvement beyond that which Admiral Selwyn brought out in 1867-68. I gave up trying to do anything with it simply for this reason, that we could not possibly get the oil at a price that would pay; as soon as we tried to make contracts for the oil at a price that would pay better than coal, the market rose, and the result was we were floored. The matter rested until Admiral Selwyn took it up some years afterwards and made sundry improvements in the injectors. Mr. E. H. Aydon, C.E., who died last year, was the first who, as far as my knowledge goes, ever injected petroleum into furnaces by means of steam. The injector system is the only system which has proved effective. Admiral Selwyn has improved that injector very much, and has been lately burning a considerable quantity of oil for the purpose of showing the public that it is possible not only to burn it but to burn it well, and to enable us to use the oil in our Navy. Its importance to this country is beyond anything that can be possibly expressed. Unquestionably we must come to it at last. Why are we losing all this valuable time before we do it? This thing has been known for the last eighteen or twenty years, and it has been shown how to burn it properly, and yet we cannot get the public, for some reason or other, to entertain the matter. I am sure we are all deeply indebted to Colonel Stewart for his paper, and I should like to mention that I think we are equally indebted to Admiral Selwyn for the persistent way in which he has adhered to this subject and the improvements he has introduced. The process used on the Caspian is simply a copy of Admiral Selwyn's. I do not wish to disparage Mr. Urquhart's process because it is the right one, but still he ought to give due credit, I think, to the original inventor.

Admiral the Hon. E. R. FREMANTLE, C.B.: I am glad to say a few words on this question, especially because it had been dealt with to some extent as from a national point of view by some of the last speakers. We have had a very instructive and a very useful lecture, and everything which tends to the pursuit of science, and especially to nautical science, is in this theatre very well received, and we are in our right in discussing it. From that point of view I feel quite certain that what Colonel Stewart has said is not in the least exaggerated, and those gentlemen who are so well acquainted whether with the wells in Asia or with the scientific results

of the use of petroleum, have all borne witness to the fact that the prospects of its general utility have not been the least exaggerated by Colonel Stewart. There is no doubt, I think, that the evaporative power has not been exaggerated. There is no doubt, I think, that the capacity of storage of the oil and its other advantages over coal have not been exaggerated. As to the question of coaling, I think that must approve itself to all of us, the same as regards cleanliness, and certainly we should have very much fewer stokers, and very great advantages would accrue to our passenger steamers, especially those which have to go through the tropics. All those matters I willingly admit, and all those matters are no doubt subjects of congratulation. But when we look upon it rather more from a national point of view, though I can quite understand it may be a subject of great congratulation to Admiral Selwyn, who has so often and so well brought the subject before us in this theatre, to find that coal is likely to be so very shortly dispensed with, and that we should have to draw our supplies from petroleum; it is *succès d'estime* to him, but I question very much whether it is a subject which is one of congratulation to this country. Mr. Marvin has touched upon the question of the large industry and the immense amount of capital employed in our coal mines, and we cannot look entirely with satisfaction to the depreciation of that very great industry. Therefore I hope that it will be the case that these beds of shale to which Admiral Selwyn alludes may be found to be capable of producing some sort of oil which will be useful, though I may doubt whether it will be able to come into competition with the oil which we hear is so prolific in these wells in Asia. It cannot be a satisfaction to us to assume that all our vessels will have to go to the Black Sea to get that fuel; that is a thing which requires no argument whatever. There are industries which are conducted on one side of the globe and industries on the other side of the globe, and occasionally you find what is better for one set of people and which may be well worked with advantage on the Eastern Hemisphere cannot be worked with advantage on the Western. So it may be for a certain time to come with regard to coal, that is to say, that it may still be an advantage for a very long period of time for our vessels to draw their supplies of coal from England, whilst vessels trading in the East and I quite admit in the Red Sea, and not only in the Black Sea but perhaps also in the Mediterranean, may draw their supplies of petroleum from the Russian wells. But whilst on that question I regret to find that there is so very little of the British Empire where these wells of petroleum are to be found; perhaps I ought not to say "very little." It is mentioned in the table that petroleum is found in Upper Burmah, and Canada and New Zealand are also mentioned. I should like to know whether the lecturer or any one is aware to what extent it could be supplied in New Zealand. I have alluded to the question of the coal supply in England, and we know also that in Australia there is an exceedingly good and satisfactory coal found in very large quantities at Newcastle in New South Wales; therefore, as far as the British Empire is concerned, and as far as our interests are concerned, it would appear that our interests are still on the side of coal, and therefore I cannot share in the feelings of one of the speakers, who seemed to be very much astonished that we were not as a nation disposed to take up petroleum very rapidly. The question will eventually be decided as to what is the cheapest material to burn, and if the cheapest material to burn is petroleum I cannot doubt but that in the process of time all the mercantile communities whether of this or other countries will generally use liquid fuel in their steamers; it has been pointed out with great force about the enormous coal expenditure of our American lines, which I believe to be perfectly correct. That being so we shall in process of time undoubtedly have great stores of this petroleum in different places, and when that is the case men-of-war will certainly follow suit. But until that is the case, while the mercantile community have stores of coal in different parts of the world, although the Government might be inclined to make stores of petroleum, I question whether they would be able to have a sufficient number of these petroleum stations to supply their needs, and whether they would not have occasionally to come down upon the mercantile community for supplies, and unless those supplies can be given we cannot expect the Government to take the lead very much in allowing their ships to burn petroleum. I wish to conclude by asking one question, as to whether Colonel Stewart can tell us whether with this *astarki*, which appears to be a product of considerable specific

gravity, and which appears to be rather thick as far as we can see it, there is any deposit at the bottom of the bunkers in which it is used which requires to be cleaned out occasionally, or whether it is perfectly fluid so that there is no difficulty of that sort arising?

Admiral SELWYN: May I say I think Admiral Fremantle has a little mistaken what has been said before? I have told him that this is a material which exists in this country in larger quantities than in any other, but it is in the solid state. The oil is extracted from it by the application of heat obtained from the substance itself, and we can dig more of this than we can of coal, and much more easily. Secondly, that there is this oily substance in some form all over the world; Australia, New Zealand, British Columbia, every part of the globe in which we could wish to find liquid fuel for any purpose whatever contains it; thirdly, that it can be laid down as easily as coal, and instead of losing half its calorific value in six months, as coal invariably does, this will conserve its value for a century or longer if stored in the most inexpensive and simple way.

Mr. MARTELL (Lloyd's): So long as this question was confined to the remarks of Colonel Stewart I did not think it necessary to rise to make any remarks, but I think, from what has been said by Admiral Selwyn and some others, a wrong impression may prevail on this question. Colonel Stewart in his remarks confined himself to the use of this liquid fuel within a certain compass—the Mediterranean and the Eastern ports. The remarks of other speakers show that this can be utilized and made use of for all parts of the world, and the impression may go abroad that such is the case. Up to the present time I think that would be quite a mistake altogether, and I will tell you why. There is no doubt, as Colonel Stewart has said, the question of practical difficulty in the use of this liquid fuel has been overcome. It can be used, there is no question about it, and it now resolves itself into a question of cost as compared with coal. What is this question of cost? At the present time crude petroleum is selling at Philadelphia at something like 3*l.* 14*s.* a ton. At a very low freight it costs 15*s.* a ton to bring that across the Atlantic, and that makes it something like 4*l.* 5*s.* a ton. How is it possible that that can compete with coal? Take the Russian product: crude petroleum is something like 2*s.* 6*d.* a ton. By the time it arrives at Batoum it would cost something like 25*s.* The distance you bring that is about 3,000 miles, the same as across the Atlantic, and the freight would be about the same. By the time you get it in England the cost would be about 40*s.* Well now, how can that compete with the cost of coal in this country? There is no fear of this at the present time superseding coal here, because when we get the very best coal at something like 8*s.* or 10*s.* per ton, and I know at the present time steamers that are going along the north-east coast, colliers, that have special boilers made expressly that are burning the dust coal, and they are getting that on board for 2*s.* 6*d.* a ton, how is it possible that oil at the present time can compete with coal? A very different state of things will have to take place. I look forward to something being done in the way of very much cheapening this petroleum, because when we have an unlimited supply such as has been shown by Colonel Stewart, it is a very desirable thing indeed to utilize that to the utmost extent. And to show what impression the question of petroleum has made upon the shipowning public of this country, I may tell you at the present time there are something like half a dozen ships being converted for the purpose of carrying from 2,000 to 3,000 tons of this oil in bulk instead of carrying it in casks, and thereby reducing the cost. I also understand that there is in contemplation the formation of a Company in London who purpose building a large number of ships that will carry something like 3,700 tons to cross the ocean with refined oil. If this can be done successfully and profitably, I hope it will extend to crude petroleum for the purpose of liquid fuel, because unless we can bring it to this country I do not think it will be sufficient to take it to Malta to utilize it for the war-ships of this country. These war-ships have to sail from this country and, therefore, the petroleum must first be brought here, and additional expense incurred unless this liquid, petroleum, can be reduced in cost in bringing it to this country. I am afraid, notwithstanding the very enthusiastic manner in which Admiral Selwyn and others have brought this question forward, it is hardly within measurable distance at present. As regards the use of shale oil, I know myself that

the managing owner of a large steamship company was desirous of using it, and made inquiries respecting it, but he found that there was not sufficient of this refuse oil produced in this country to supply his fleet alone. Unless, therefore, you can produce the crude oil for this purpose, which we can easily understand could not be done now, where the advantages of refining it would far more than compensate for selling merely the refuse of it, unless you can get a large supply of crude oil in that way, there is no fear in this country of oil superseding coal as has been asserted by Admiral Fremantle. This oil has been used in this country in a vessel called the "Himalaya," that went from London to Edinburgh, and it was used with success from an engineering point of view. There was one disadvantage found attending the steam spray, namely, that it took a very large quantity of steam from the boiler and consequently a very large quantity of fresh water which had to be replaced by salt water, and the boiler was salted up in consequence. That of course would be a very great objection on a long voyage; even if the oil were used economically for short voyages, that would be a very great objection in long voyages, unless the engineering skill and intelligence of this country could overcome it, which no doubt would be the case if it could be brought here at a moderate price so as to compete with coal.

Mr. HENWOOD: With reference to the remark that Mr. Martell has made that it would be impossible to steam war-ships out to the East and then get them supplied with oil, I would like to say this, that it would be quite easy to steam them out with coal, and then get them supplied with oil. The furnaces could be altered in 24 hours so as to burn oil. Then as to the question of using the steam for the spray it is quite within contemplation, and in some large steamers certain boilers are provided for maintaining a supply of fresh water.

Mr. MARTELL: A ship of that kind must be fitted with coal bunkers.

Admiral Sir ERASMUS OMMANEY: It appears to me that the main point of this paper is to tell naval Officers the very great advantages that would accrue to any navy that use this fuel instead of coal, and I am sure every naval Officer will be very much obliged to Colonel Stewart for the information. If the advantages are so very great, surely we should not stand at trifles with regard to the cost, if the advantages are so very redundant. I only hope that this paper may be read by every naval Officer, and I hope that every person who is connected with the administration of the Navy will consider it. I think it would be very desirable that the Admiralty should fit some of our vessels on the home station with the same appliances for the use of petroleum fuel as those adopted by the Russian Navy in the Caspian; for instance, we employ vessels around our coasts for conveying stores between our dockyards and military stations, if such vessels could be navigated by this fuel we should soon ascertain the practical and economical advantages to be derived from this fuel, and the experiment would be most instructive in a national point of view for all parties concerned in our maritime interests.

Colonel BAYLIS: At this late hour I am reluctant to rise, but I think we may say the advantages of liquid fuel are so great over coal that if it can be applied, it ought to be applied. Of course it is a question of cost; if you can produce a better and more useful article it becomes, then, a question of price. As Colonel Stewart has alluded to the price it would come to this, whether we can obtain this liquid fuel for vessels for use on the Suez Canal or in the Mediterranean at such a price as would induce persons to go to the market and enable them to say that they will have it in preference to coal. I should like to make a remark with regard to the shale. We know that liquid fuel can be obtained from shale and I believe also from coal, but the earliest patent for obtaining oils and liquid fuel from shale and coal was taken out as long ago as 1850. That is a long time ago, and no doubt the patents have run out, and therefore I suppose we may consider that it has not been a success, for want of cheapness as compared with coal.

Admiral SELWYN: It is done at the present day, and large fortunes have been made in Scotland.

Colonel BAYLIS: The earliest patent was in 1850. I can quite enter into the feeling which Admiral Fremantle has alluded to that we should like to be able to supply ourselves, and no doubt that will commend itself very strongly to us if we can get liquid fuel at home and use it for our ships at a price that will pay in com-

parison with coal. Allow me to deviate for one moment. It is very curious indeed to find rock oil mentioned in very early history. You find it in the Book of Job, and it is mentioned in this way: in the 29th chapter and the 6th verse, Job, in speaking of the great blessings of which he had been deprived, and of his former prosperity, says this: "When I washed my steps with butter, and the rock poured me out rivers of oil." I think that is the earliest mention of rock oil.

Colonel STEWART, in reply, said: I wish to thank Admiral Selwyn very much for the kindly things he said about my lecture, but there are one or two little points I wish to explain. He objected to my statement about the values of astatki relatively to coal. I stated that those values were simply taken from Mr. Urquhart's work. Mr. Urquhart is said to be about the first petroleum engineer in Russia, and I gave you his statement. As to the difficulty about the pump, pumps have been tried at Baku, and leather was of course used in the valves, but the sand wore out the metal portion of the pumps, and they had to give them up.

The CHAIRMAN (Sir P. Lumsden): I think, gentlemen, at this late hour of the evening I need not say much. We owe a debt of gratitude to Colonel Stewart for the very able manner in which he has brought this subject before us. I may here corroborate the statement made by Admiral Selwyn with regard to the relative values of oil and coal in steamers, because when coming over the Caspian last year in the "Alexander IIIrd," the largest steamer on the Caspian, the captain assured me that after trying coal and oil for the last fifteen or twenty years he found in practice that in the same bulk, with greater facilities of package, oil would carry the steamer between three and four times longer than coal. We are extremely indebted to the different scientific gentlemen who have favoured us with their remarks. I think the discussion altogether has been a very useful one, and I hope will be taken up by the public as it certainly deserves to be. We have petroleum in all parts of our Empire—we have it in Canada, Nova Scotia, Columbia, Burmah, and in India generally, especially at the foot of the Suliman range. It is showing itself in Europe as well as in Asia. Only last year in going from Varna to Venice I met the American agent of the United American Oil Company, who had come over to that part of Europe to find out why the demand for American oil had ceased, and he found no less than nine petroleum companies, several of which were in the hands of Englishmen, excavating petroleum wells at the foot of the Carpathians. In Galicia and Roumania there seems to be an almost exhaustless supply of petroleum. It is found in Italy and in Spain within 20 miles of Cadiz, and of course should it hereafter be proved that petroleum can be worked economically it is everything for us to find stores and depôts in all seas. The springs of Columbia, New Zealand, Barbadoes, and Egypt will be of the greatest importance hereafter to this nation, because we must bear in mind that in sailing days the period a ship could remain at sea was only limited by the amount of its provisions, but now it is regulated by the number of days it can steam, or by the time that must elapse before it can get another supply of coal. Therefore, it stands to reason it will be a great advantage if we can enable our ships to stay at sea two or three times longer than they can at present and be at any time replenished with fuel. There is no doubt if a demand were created, that any amount of oil can be procured. Perhaps you are not aware that in the copper fields in Lake Superior and in the mounds of the Mississippi there are the vestiges of wells which were worked by an unknown people that existed in America before history, and we may perhaps find this to have been the case also at Penjeh. Doubtless the whole of that valley is studded with mounds that may be of the character described by Colonel Stewart as indicating the existence of petroleum. There is no doubt petroleum presents itself along the base of the Hindu Koosh; also along our Indian border from Quetta to Peshawur it is found along the whole Suliman range, and it is just a question to what depth we have to sink to find petroleum of a workable character. In 1859 petroleum was discovered in large quantities in South California, but our Yankee cousins immediately ran down the price of petroleum in Pennsylvania to such an extent, reducing it from 17 dollars to 1½ dollars a barrel, that the hope of Californian trade had at once to be abandoned. From official reports it would appear that ten years ago the amount of petroleum produced in America was almost identical with that at present taken from the Baku wells, but to give you a slight idea how the amount in America has increased I may quote that the yield of

crude petroleum in 1864 in America amounted to 104,105,778 gallons, but last year that had increased to 913,525,998 gallons. The amount of naphtha exported in 1864 was 438,197 gallons, and in 1885 it had reached 15,822,853 gallons. The export of illuminating oil, which in 1864 was 12,791,518 gallons, had increased in 1885 to 458,243,192 gallons, and in that same year the export of residuum was 6,561,660 gallons. The total export in 1864 was 23,210,369 gallons, which had increased in 1885 to 574,668,180 gallons. "As a given number of gallons of refined petroleum represents the product of a large number of gallons of crude petroleum, it is necessary to reduce the exports of petroleum to their equivalent in crude oil in order to arrive at a knowledge of the percentage of mineral oil exported. It has been ascertained as the result of a careful computation that the quantity of petroleum and its distilled products exported during the year ending June 30, 1878, was equivalent to 407,482,175 gallons of crude oil, or in other words that the exports of petroleum constituted about 66 per cent. of the production. A larger percentage of the mineral oil product of the country is exported than of any other product except cotton." I have no doubt, if the demand were created, the increase would take place in other quarters of the world as well as in America; but this question of the application of petroleum for creation of steam is still in its infancy, and it may become one of the greatest questions of the time. I now beg in your name to return Colonel Stewart our thanks for his interesting lecture.

Wednesday, July 14, 1886.

MAJOR-GENERAL SIR FREDERICK D. MIDDLETON, K.C.M.G.,
C.B., Commanding Militia of the Dominion of Canada, in the
Chair.

REVOLVERS AND THEIR USE.

By Major H. E. C. KITCHENER, Duke of Cornwall's Light Infantry.

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Preface.

BEFORE commencing this paper, I wish to express my acknowledgments to the many Officers and others who have so kindly assisted me with their experience and advice in compiling it.

I would also wish to point out that there is very little reliable printed matter to be found treating on the revolver, and therefore, no doubt, there will be many mistakes in this paper. I trust, however, that the discussion which I hope will follow will tend to remove them.

Introduction.

Most of us have a hobby of some sort, and for the last few years "Revolvers and their use" have been mine.

My hobby horse, like other horses of a like nature, has a trick of getting the bit between his teeth, and boring, if not his rider, at least his rider's friends.

I therefore venture, before I commence this lecture, to ask your indulgent consideration of the subject I have to lay before you; and I trust that, though much may prove to be chaff, some grain may be found.

I.—Importance of Revolver Training.

As honorary secretary of the R.M.C. Revolver Club, I have had opportunities of observing the difficulties which beginners find in the use of the revolver, and I have been astonished at the improvement after a few weeks' training.

The importance, too, of such training has been brought forcibly before me.

Surely coolness and presence of mind at critical moments are all-important in an Officer, and any means for fostering and engendering these qualities should be encouraged. Now it is obvious that a man who feels confident in being able to protect his own life would be cooler and more self-possessed than one who has no confidence in his weapon or in his ability to use it.

An Officer's life is always valuable, especially so when conveying orders, or when reconnoitring to the front, and if he be a good revolver shot, he may pass with safety where otherwise he might fail.

For example, during the American war a Federal Lieutenant conveying orders, attended only by one orderly, was surprised by a party of the enemy's horsemen. He drew his revolver, and picking off

FIG. I.
TYPE OF SOLID FRAME. SINGLE ACTION REVOLVER.

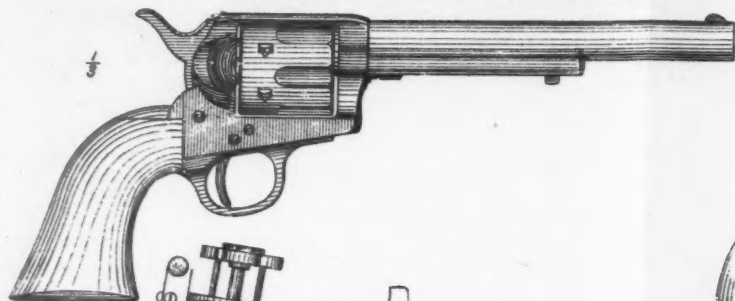


FIG. II.
TYPE OF JOINTED
SELF-EXTRACTING REVOLVER.

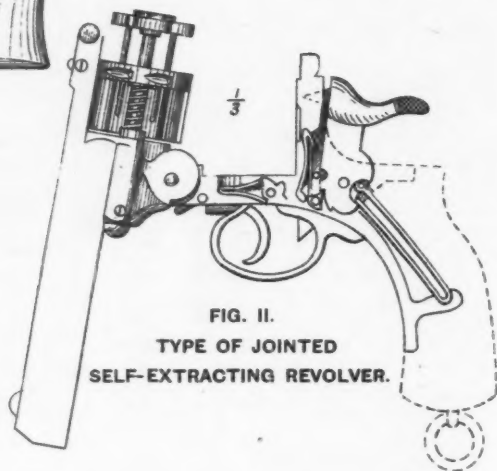


FIG. VIII.

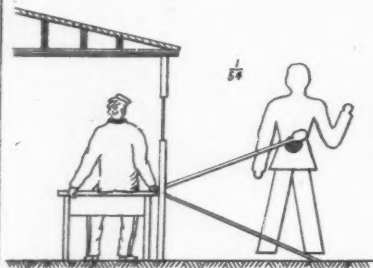


FIG. X.
RUNNING MAN AS SEEN WHEN
COMING DOWN THE RANGE.

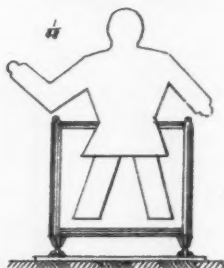


FIG. XI.
RUNNING MAN BEFORE STARTING
AND AT END OF RUN.

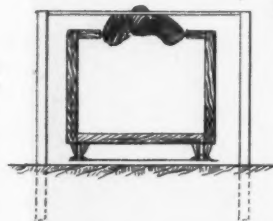


FIG. III.
TYPE OF PISTOL.

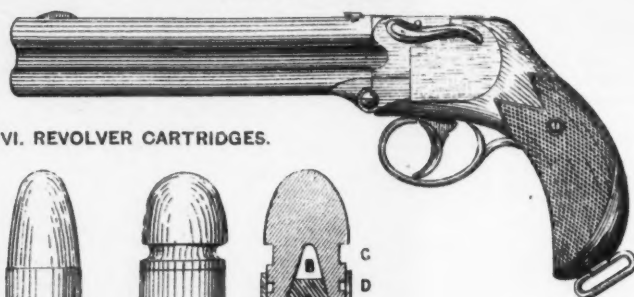


FIG. VI. REVOLVER CARTRIDGES.

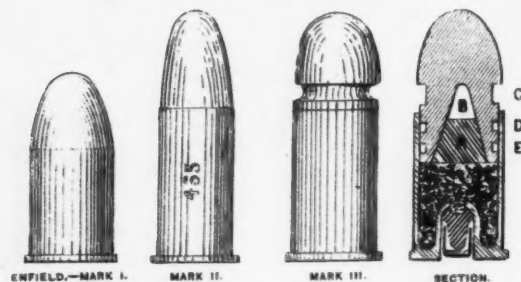


FIG. VII. EFFECT OF RECOIL.

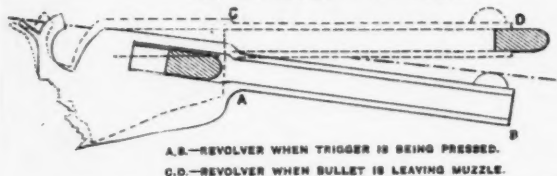


FIG. XIII.

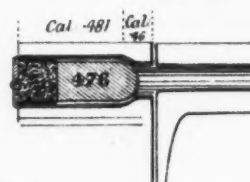


FIG. IX.
REVOLVER RANGE.

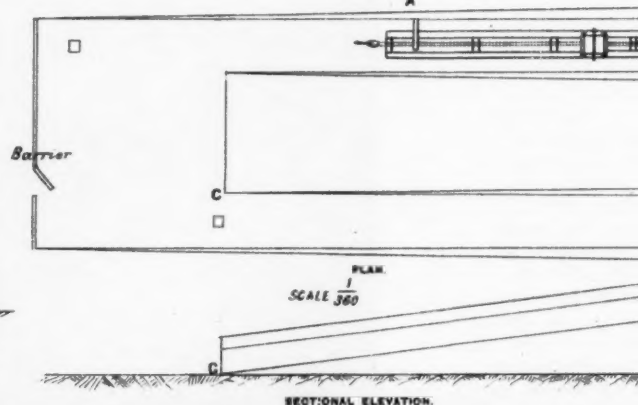


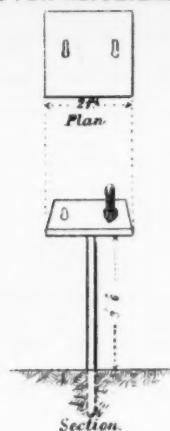
FIG. IV.
TABLE FOR REVOLVERS (R.R.)

FIG. V. REVOLVER RANGE.

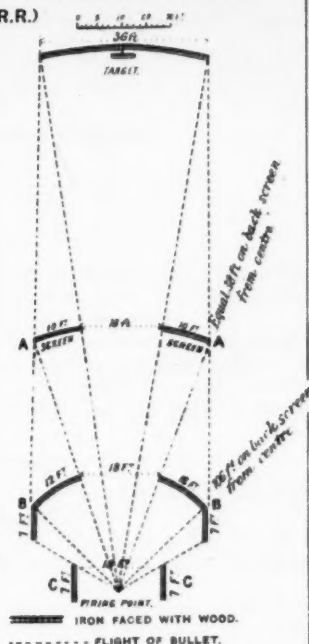


FIG. XII.

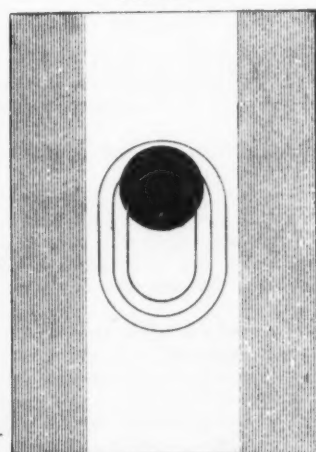
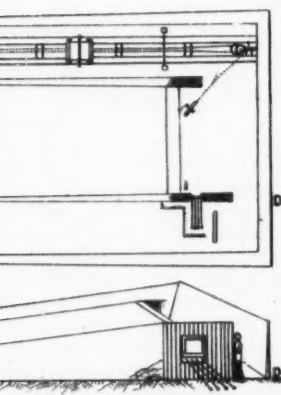
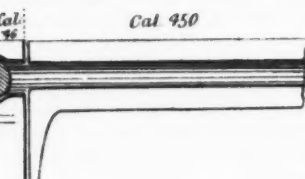


FIG. XIII.



four of his assailants so discouraged the remainder that they permitted him to proceed on his way unmolested.¹

Perhaps one of the noblest opportunities of displaying gallantry is in rescuing a comrade at the risk of one's life. A good revolver shot may often succeed in doing this, where a bad one would be not unlikely to add his own loss to that of his comrade.

Again, a revolver, from its shortness and single and double action, is a very dangerous weapon. In the Far West this is recognized to such an extent that it would be a breach of etiquette for a man to touch a friend's revolver, however close it may be to his grasp.

On the Congo, not long ago, a missionary severely wounded himself in the leg with his own revolver.

Many of us here this afternoon will remember how Colonel Gonno was accidentally wounded at Hounslow, just before the Zulu campaign.

If, then, accidents like these can and do happen where men are cool and collected, how much more likely are they to occur in the heat and excitement of action.

Should the Revolver be carried on Service?—It is urged sometimes that the revolver is too dangerous a weapon to be used in practice; but if so it should not be allowed in war.

Whether a revolver should be carried or not on service is still an open question. Some advocate its entire disuse, others that it should be confined to the Staff and cavalry.

No doubt to a mounted Officer the possession of a revolver and the ability to use it may often be of great value. There are times, too, such as at Abu Klea and Tammai, when the infantry Officer may turn the weapon to account. Colonel Byam, C.B., York and Lancaster Regiment, who has had considerable experience, writes on this point as follows:—"I think a revolver is better than a double-barrelled pistol, especially for an Officer who has to perform his duties on foot.

"My experience in the Soudan, 1884, goes to prove that an Officer may get into a scrimmage, and be surrounded by a number of the enemy, when he might require more than the two shots he would get with a double-barrelled pistol before he could free himself. I had a six-chambered Royal Navy revolver at Tammai when the Arabs rushed the 2nd Brigade square. I was at the corner of the square formed by my battalion when the rush came, and my men were forced back. I fired into the faces of two Arabs, and was then knocked over on my back. In this position I fired again; on regaining my feet, I was surrounded by Arabs, and fired my other three barrels into the faces of men close to me. Several men of the regiment came to my rescue, and I found an opportunity to reload, and was again in a position to fire, which luckily I had not to do. Loading did not take more than one minute. . . .

"I certainly think Officers should be trained to shoot with the right and left hand at distances less than 25 yards with a revolver cocked, and also half cocked, pulling the trigger from half cock and firing.

¹ Scott's "Partisan Warfare."

"A careless or excitable man *may* use his revolver at a wrong time, but anyone accustomed to handle one should not do so.

"I heard of no instance of the Royal Navy pattern of revolver getting out of order; there were, however, some intricate patterns that were reported to have jammed. I always looked to mine after a march, and again before settling for the night.

"I may remark that shooting at distances over 25 yards is a mistake. I recommend practice at 10 yards. On service it is better to reserve your fire till within 5 yards of your enemy. A mounted Officer might find a double-barrelled pistol very useful."

Again, Colonel Gilmore, in his "Four Years in the Saddle," says: "We had nearly all got through a fence when I saw Kemp engaged with a powerful fellow, who was closing in upon him with sword upraised. Kemp always carried two pistols; in one he had but one load; that he fired at his adversary, but missed, then threw the pistol at him and struck him in the breast. The trooper closed in upon him before he could draw his second pistol, and seizing him by the hair, tried to drag him off the horse, at the same time lashing him across the shoulder with his sabre. Kemp held down his head and took it, all the while trying to draw his pistol. I had cut my way to him, and had raised myself with uplifted sabre to cleave the fellow's skull, when Kemp discharged his pistol into his stomach, and he was free."

Those who advocate the entire disuse of the revolver admit freely that at times it is of value, but urge that this value is more than compensated by the mischief which, either through accident or ignorance, it may occasion. A General Officer commanding a brigade in Egypt told one of his regimental Officers who had a revolver in his hand to put it up and look after his men, not himself, and that his men would look after him.

Among the adherents of the revolver great differences of opinion are found as to which is the best weapon, some being in favour of one, some of another.

The double- or four-barrelled pistol also has many friends: they urge that they are simpler, that they possess more stopping power, and that, owing to the striker revolving and not the barrels, their mechanism is able to be better protected from the effects of the weather.

Sir Archibald Alison, writing on this subject, says: "Every Officer should carry a revolver on service, and as a matter of course be instructed in its use; when I say every Officer ought to have a revolver on service, I mean that he should have a weapon of that kind; but whether that should be a revolver proper or a double-barrelled pistol I am not prepared to say. On service myself I have always carried a revolver."

There is something to be said, too, in favour of smooth-bore barrels for weapons whose use is essentially at close quarters, and from which it is desired that a heavy shock to the object aimed at should be given.

Should Officers be armed with a Rifle?—In the Bechuana Expedition all Officers carried the carbine or rifle; and Colonel Leach, *U.C.*,

C.B., saved his life and that of his party by the use he made of the latter weapon in the Afghan Campaign.

Colonel Methuen, writing on this point, says: "My opinion is very divided. If an Officer is not armed with a carbine he loses a chance. If he has a carbine and makes use of it when not absolutely necessary, he may be neglecting his men.

"I do not consider it is an Officer's duty to kill; he has to superintend the action of his men.

"Fighting against the Boers as mounted infantry, I think an Officer *must* be armed. He may at any moment find to be so is an absolute necessity.

"Fighting against a European enemy, I believe he is never very likely to require a carbine, and if the worst came to the worst he could pick up a rifle *pro tem*.

"Sir Charles Warren lost two Officers in his previous expedition in Bechuanaland West from their not carrying carbines.

"If revolvers are used, by all means have an Army pattern, and have all Officers instructed in its use. I gave up the idea of any but a Martini-Henry rifle when going to the Cape, because it must be a *sine quâ non* that any arm taken on service should carry Government ammunition. But you will scarcely find one Officer who has had practical experience recommend a *revolver*; he will urge you to use a *double-barrel horse pistol*. I understand there are three objections to the revolver: it jams; the bullet is not sufficiently large to give the required shock; it delivers the fire too high. Personally I do not intend ever to use a revolver, as I mean to stick to my pair of Holland's horse pistols."

When considering the advisability of carrying the revolver or not, its moral effect should not be lost sight of. Perhaps there is no weapon which produces a greater effect in this way. A rifle when loaded may miss its aim, and when empty is useless. The revolver to an assailant is always a loaded weapon, and we require foes as brave as the Zulu or as reckless as the Soudanese to charge home when confronted by it. Again, a loaded revolver gives confidence to its possessor. If he has practised with the weapon he knows that, if held straight, six men must fall before he can be closed with; if he has had no practice with it he is equally confident, for few believe until they have tried how difficult it is to hit a man at even such short ranges as 10 or even 5 paces.

In practice the number of rounds fired is constantly forgotten, even by the marksman himself; how then can they be reckoned by an enemy in action? There are many cases of an empty revolver saving both life and property. A short time ago there was an account of a lady who, by presenting an empty revolver at a burglar, prevented his escape.

Lastly, it must be remembered that the question of revolvers *versus* pistols has been studied in other countries besides our own, and the result has been the universal adoption of the revolver.

II.—*Necessity for Training Officers in the use of the Revolver.*

No doubt many Officers in our Army are good revolver shots, the results of the annual inter-regimental revolver contests (established some time back by Major Salmond, Royal Scots Fusiliers) show this to be the case in peace: last year the winning Officer, Major Harley, the Buffs, scoring 57 out of 60 points. On service too there are numerous cases when Officers have shown their proficiency with a revolver. Captain Burn-Murdock, of the Royals, who, with his legs jammed under a dead camel at Abu Klea, succeeded in killing four or five Arabs, who attacked him while in this critical position, is a case in point. But there are a great number of Officers who know little of the weapon, and some who know nothing at all.

Major King-Harman, B.S.C., lecturing at Simla last year on the subject, says: "It has always seemed to me a very strange thing that, although there is constantly continued and even increasing expenditure of time, trouble, and money on the instruction of the rank and file of the Army in the use of their weapons, yet no attention whatever is paid to the actual fighting capabilities of the commissioned Officers; and it seems to be taken for granted, either that they are quite perfect in the use of their weapons, or else that skill in the use of them is a matter of no importance."

Manner in which Revolvers are often purchased.—Of late years many Officers have been suddenly ordered on services of a nature when a knowledge of the revolver would have been of the utmost importance to them. On receiving their orders, those not in possession of revolvers hasten to town, and purchase a so-called "regulation revolver," good, bad, or indifferent, as fortune may decide.

Major McClintock, writing in the "Field," says: "Although the revolver has come into so general use, there is probably no weapon which is so little understood, and in the purchase of which the customer is so entirely at the mercy of the gunmaker from whom he buys it. Very few purchasers of revolvers understand the merits of the different types of these pistols which are offered for sale, and a still smaller number have the opportunity of testing the mechanism or the power of the weapons they buy. But there is no arm which should be selected with greater care, as when required for use the owner is generally in extreme peril and the failure of his arm may cost him his life."

On the Officer returning with his purchase, he may, if time permits, pay two or three visits to the nearest range, when a hasty practice is attempted (it was during a practice of this sort that Colonel Gonne was wounded), or, if time does not permit of this, he contents himself with what practice he can get in fine weather during his passage out. Now, in these days of progress, should such a state of things be possible?

Amount of Instruction our Officers receive in Self-defence.—Down at Sandhurst we teach the young Officer to command a brigade, to build a fort, to survey a country, to ride a war horse, and to climb a pole, but the only authorized course of personal defence or offence are ten

short lessons in sword exercise; that these lessons should teach anything more than a few parade cuts and guards is hardly to be expected.

After getting their commissions a three months' course of gymnastics is gone through: during which, if the classes are not too large, a few more lessons in sword drill are given.

The outcome of this and other training is that fine display known as "sword exercise" at General's Inspection, which, though imposing to the crowd, is well known to be more or less useless for all practical purposes.¹

Colonel Crookshank says on this point: "As for the sword exercise, in my own experience that has been an annual farce; I have commonly seen the Inspecting General turn his back on the performance, as being too painful to be witnessed."²

Colonel Onslow on Self-defence.—Colonel Onslow, Superintendent of Gymnasia, writing on this subject, says: "I think that all Officers should be instructed in the use of the revolver, and the cadets might be taught how to handle it at Sandhurst, and also upon first joining their regiments, as, if once properly taught how to use the weapon, they would require but little practice afterwards to enable them to defend themselves in a scrimmage. It is the infantry Officer's only weapon. I don't think he would care to depend on the regulation sword for his protection, and besides I do not believe that one infantry Officer in ten ever learns how to use a sword, and it is not, in fact, a weapon which can well be used on foot; at least such is my opinion. However, I may be wrong, but at any rate I have rarely met with men who have been at all handy with a sword, dismounted. A man may be very good with a single stick, but a duffer with a sword."

Sir Francis De Winton, also writing on this subject, says: "Except for parade purposes, or for cavalry, a sword is a useless and foolish weapon, and a revolver in the hands of a confident and practised man would be a far more efficient weapon for either offensive or defensive action. In fact, there cannot be any comparison between them.

"With reference to shooting, I have seen very fair practice made with a revolver in the hands of a man accustomed to use and handle them.

"I have known several instances where accidents have occurred from want of a proper knowledge, and I therefore consider the revolver is a dangerous weapon to every one when the owners do not know how to handle them.

"A course of practice or instruction in the use of revolvers could not fail to be useful, because it would give confidence and knowledge, and a certain amount of practice would naturally increase efficiency in shooting."

Unlike Continental armies, we have no course of revolver shooting for Officers, and therefore, officially, an infantry Officer can hardly be expected either to defend himself or assail a foe. Now how has this

¹ Since writing the above I have learned that General Roberts has substituted single stick and revolver practice in India; could we not follow in his wake?

² "Pioneer," 22nd July, 1895.

state of things arisen? Possibly this way: in the days of our fathers every Officer knew he was liable to be called out, and consequently that his life might depend upon the turn of his wrist or the steadiness of his eye, he therefore constantly practised both with sword and pistol, and the results arrived at with the pistol were little short of marvellous; cutting out the ace of diamonds at 12 paces, shooting a swallow on the wing, if not everyday occurrences, were at least not unusual. Shooting like this can never be expected with the revolver, but a fair shot ought to be able to place every bullet within a target 1 foot square at 30 yards distance. Duelling being still carried on in Continental armies, it no doubt serves to keep up the knowledge of self-defence. With us, however, the old custom of pistols for two and coffee for four has passed away, and with its departure comes the necessity for some course of training both with pistol and sword.

III.—*Scheme for Instruction of Officers.*

Proposed First Course of Instruction.—Out of the 300 gentlemen cadets now at Sandhurst, 246 pay 10s. per term for the privilege of practising in their own time with the revolver. Many of them become good shots, but others no doubt get tired of the walk to the range, and leave the College with as little skill in revolver shooting as when they entered it. The drier portions of the subject, such as taking to pieces, and cleaning the weapon, it would be quite useless under present arrangements to attempt to teach.

If, however, the authorities could see their way, while retaining the voluntary nature of the practice, to allot 200 marks (the same as is now given to riding and gymnastics) for proficiency in the use of the revolver, there would not be a cadet in the College who would not practise frequently.

In the event of marks being thus awarded, it would be necessary to open the subject to all cadets by making the charge compulsory. This charge, which would include examination, instruction, marking, and 100 rounds of ammunition to each cadet per term, would not exceed 10s. per head.

Major Savile, Professor of Tactics at the Royal Military College, writes on this subject as follows: "Concerning revolver shooting and instruction, it is my opinion that, if it is desirable that an Officer should know how to defend himself in action, it is obviously equally desirable that he should be taught the best means of so doing.

"If the matter is considered merely from a tactical point of view, it can hardly be denied that the preservation of the lives of our Officers during an action is of the highest importance, in order that the men may be properly led and directed, and that the plan conceived by superior authority may be correctly executed.

"Although actions in modern Continental warfare may be said to be mainly carried on at long range, and therefore during the greater part of a battle the sword and revolver carried by an Officer can hardly be looked upon as anything but encumbrances to his free action, still local fights in villages, woods, and enclosures almost invariably occur

in the course of a long action, and if an Officer so engaged leads his men properly, and sets a good example, it is certain that he will have to defend his life by the use of his sword and revolver; that the cases in which this will occur in savage warfare will be infinitely multiplied, is a fact patent to all.

"For these reasons, I strongly approve of any measures which will tend to promote good revolver shooting amongst our Officers.

"I fail to see any good cause why your scheme for introducing revolver shooting at the Royal Military College as a voluntary subject should not be carried out. I do not consider that the practice would in any way interfere with the instruction in other subjects, there is ample time available for it, and I am sure that regulations could easily be framed for conducting it in an efficient and practical manner."

Major Scott, Professor of Fortification at the Royal Military College, writes: "My idea is that a cadet should be instructed at a military school in those subjects which will make him ready to join his regiment as an efficient subaltern (not General) Officer.

"What subject can be more practical or useful than shooting? I agree in the main with your revolver practice scheme. Experience alone can test its practical working. I quite agree with you as regards the award of marks for practice. I personally should like to see this principle extended to rifle shooting as well.

"Shooting is a subject to which an award of marks is eminently suited, because their distribution must be fair, inasmuch as the amount allotted does not depend upon the fads and fancies of various individuals, but upon an actual score obtained at practice by individual exertion.

"Some years ago it was suggested that marks should be allotted to all athletic accomplishments, but a fair system of marking for proficiency in cricket, rackets, &c., presented an insurmountable obstacle.

"Such is quite the reverse with rifle shooting: points obtained count as marks 'et voilà tout.'"

Colonel Abbott Anderson, Professor of Surveying at R.M.C., writes: "I have perused your scheme for revolver instruction and for awarding marks for revolver shooting, and in the main I agree with your suggestions, and am decidedly of opinion that instruction in this most useful military accomplishment should no longer be neglected."

The old French proverb about omelettes and eggs must not be forgotten in considering whether cadets should be trained in the use of the revolver. The weapon is a dangerous one, and, though practice has been carried on for two years at the Royal Military College without accident, still it is not to be expected that one will never happen. Now, is the game worth the candle?

On the one hand we have our Officers trained to defend themselves when on service. On the other, the possibility of an accident at home. Surely the accidents which constantly occur from want of early training will more than compensate for the risk on a carefully superintended range.

Changes in Ammunition.—Of course this first training ought to be kept up. Here a difficulty arises; all Officers join with swords, some with revolvers as well. These latter find that not only *revolvers* change, which would be a small matter (because, though their revolver might not be the best obtainable, they would know its shooting powers and other capabilities, and be quite prepared, if need be, to trust their lives to its care), but that the Service ammunition changes even more frequently.

An Officer who took one of Webley's revolvers to the Soudan, chambered to fit No. I Mark Government ammunition, did not find out, until he was actually engaged with the enemy, that the new ammunition was Mark III, which could not be induced to enter his revolver. Finally, he threw his revolver at an Arab whom it hit in the face. It was picked up none the worse some three weeks later, and is now in England.

During the last few years we have had no less than three different sorts of Government ammunition, some of which fits one revolver, some another, and the owner of a revolver often finds to his dismay that his outlay has been wasted. This is discouraging to would-be purchasers, and some means should be devised for meeting the difficulty. Would it be possible for the Government to have in stock a sufficient number of proved revolvers, to supply not only the non-commissioned officers, but also all Officers ordered on active service? The advantages of this would be: 1st, That all Officers would be armed with the same class of weapon, as is the case in all Continental armies. 2nd, That Officers who like to be always ready for active service would be saved considerable expense. 3rd, That by issuing a few of these revolvers to each battalion there would be no obstacle to Officers going through an annual course of revolver shooting. 4th, As the Government ammunition is made for the Government pistol, there would be no danger of the one not fitting the other.

Major King-Harman, in his lecture speaking of Officers' revolvers, says: "I am given to understand that orders will shortly be issued for all Officers to fire twenty-four rounds annually from revolvers at present in their possession, which will get them into the habit of firing off such weapons as they have got; but when the time comes, I strongly suspect that in too many cases the revolvers are very much like the swords, useless gimcrack things, that will not take Government ammunition, and that the private-made ammunition used with them is harmless rubbish that has been kept for years.

"Trained Officers don't grow like leaves on a tree, and in native regiments they are so few in number and so difficult to replace that everything should be done that is possible to preserve their lives."

Besides a short annual course, during which single and continuous right- and left-handed practice should be carried on, Officers might be encouraged to practise voluntarily by the construction of revolver ranges in or near the barracks. A space of 45 yards by 12 yards is sufficient for these ranges.

¹ "Pioneer," Simla.

In time, too, our present sword exercise at Generals' inspections might give place to more practical work, such as fencing, single-stick, or revolver shooting.

It would not appear necessary that an Officer should acquire all these exercises, but it is certainly to be wished that he should be fairly proficient in one or other of them.

Insufficiency of Annual Course.—With regard to non-commissioned officers, drivers of artillery, and others, who are armed with the revolver, some pains should be taken to teach them the construction and use of the weapon with which they are armed.

At present an annual course of twelve rounds is laid down for non-commissioned officers, but this is clearly inadequate to insure even fairly good shooting. At Abu Klea the sergeant-major of the Guards threw away his revolver and took to a rifle, perhaps the best thing he could have done under the circumstances.

IV.—*History of the Revolver.*

The first revolver dates back to about the 16th century; these first revolvers were of very primitive construction, and, following on the same lines as the revolving musket, which had been invented some time previously, were very clumsy weapons, taking more time to cock and revolve by hand for each discharge, than is now taken in loading and firing a breech-loader. I have here a curious relic of the past in the shape of an old revolving matchlock, kindly lent me with other revolvers by Mr. Wilkinson of Pall Mall. This weapon dates back to about the 16th century, the cylinder is revolved by hand, and the piece is discharged by means of a slowmatch; the stock passes under the arm in the same way as the matchlocks of the Sikhs and Afghans. It is probably of a weapon of this sort that Mr. Pepys writes in his diary, 4th March, 1664: "There are several people trying a new-fashioned gun, brought my Lord Peterborough this morning, to shoot often one after another without trouble or danger."¹

America may be said to be the birthplace of the modern revolver, and Colonel Colt its father; his weapon was for many years far ahead of English revolvers, and though Dean and Adams, and others in this country, expended much time and ingenuity on the subject, they at first made little way.

This was chiefly due to our English makers attempting the difficult task of combining the rotation of the cylinder with the action of pulling the trigger, and thus ensuring the greatest possible rapidity of fire.

Colonel Colt, on the other hand, very soon succeeded in causing the cylinder to rotate by the cocking of the hammer; he thus obtained a fair amount of rapidity with greater accuracy of fire than the English single-trigger action revolvers could hope to arrive at (Fig. 1, Plate XXVI).

Double-action Revolvers.—When, however, the idea of combining the American cocking action and the English trigger action in the

¹ United Service Journal.

same weapon, that is to say, in a double-action revolver, which might be cocked between each discharge, or discharged continuously at pleasure, was entertained, the English gun makers, who had already developed a smooth trigger action, advanced with a bound to the girths of our Yankee cousin, and a hammer and tongs race has ever since been run as to merit between American and English revolver makers.

The old pepper-box revolver, of which I have an example here, was one of these; its trigger action may be noticed, showing at what an early stage our English makers had arrived at a smooth pull-off. The old wheel pistol is another example of the early percussion type—it was a great novelty in 1839, and large numbers were made; the rebounding lock of this pistol is worthy of note.

Difficulties in manner of igniting the Charge.—Another difficulty which the earlier inventors had to struggle with was the manner of igniting the charge. In the Tower collection there is an example of a matchlock revolver; and many types of flintlock revolvers are still to be found. The percussion cap was of great assistance to the revolver makers, but the exploded cap often jammed the weapon, and it was not until the pin-fire cartridge was introduced that the revolver could be at all depended upon. After the pin-fire came the rim-fire cartridge, and this has now been superseded by the central fire.

In 1835 Colonel Colt patented his revolver, but it was not then the simple and useful weapon it has since become.

During the Crimean War and the Indian Mutiny the revolver, notwithstanding its imperfections, was frequently used with effect.¹ Major Lumley, *V.C.*, on entering the Redan on September 8th, 1855, was immediately attacked by three gunners who were reloading a field piece. He drew his revolver and shot two of them, he was then knocked down by a stone. Again, in the Mutiny at Chota Behar, Colonel Daunt, *V.C.*, rushed forward and, assisted by Sergeant Dynon, succeeded in capturing a gun by shooting the gunners at close quarters with his pistol.

Double-action Revolvers.—About 1855 Adams and Tranter brought out their double-action revolvers; they were at the time considered very superior to the single-action.

An Officer, writing in the "Field" of February 16th, 1884, says: "The revolver that I carried through the three campaigns of 1877, 1878, and 1879 in South Africa behaved as well as I could wish. This was a double-action revolver by Tranter, and although I carried it over some thousands of miles' rough travelling (in the saddle) I did not find it fail me once." But, notwithstanding this, a feeling appears to be growing that double-action revolvers, from their delicacy of construction, and liability to get out of order, are not suited for rough usage.

Colt's Single-action.—In Canada and the Rockies Colt's single-action frontier revolver is most generally met with. With this weapon the cow-boys are generally armed, and the practice they make is truly remarkable; they have also a curious knack, when rapid firing

¹ "V.C. Records."

is required, of supplying the double-action deficiency, they allow the pistol after each discharge to drop from their hand, retaining only hold of the trigger guard by the finger, the weight of the pistol and a slight jerk causes it to describe a circle, of which the finger in the trigger guard is the centre; as it comes back to its original position, the hammer is caught by the thumb, and the weapon cocked and again ready for use.

The time taken in extracting the cartridges, and loading Colt's and other solid frame revolvers, has been attacked with more or less success by both English and American makers. Colonel Silver has produced a solid framed rapid extracting revolver of some merit, while Webley, Wilkinson, Kynock, and others in this country, Smith and Wesson in America, have devoted their attention to producing jointed framed self-extracting weapons. (Fig. 2.)

Heavy Charges.—There is no doubt an impression that a self-extracting revolver cannot safely fire such a heavy charge as a solid frame revolver of the same weight, but when we consider the heavy charges fired by jointed express rifles this seems to be straining at a gnat and swallowing a camel. Again, the Enfield and other self-extracting revolvers have about the same recoil with their 18 grains of powder and 265 grains of lead as the American cavalry revolver with 37.6 grains of powder and 250 grains of lead.¹ This goes to show that the strain on the two weapons is about the same, and when it is considered that the 18 grains of powder in the Enfield has to force a 0.476 bullet first through a 0.460 cylinder and then through a 0.450 barrel this is hardly to be wondered at. It must also be remembered that the revolver employed by the Russian cavalry is a self-extracting weapon, which safely carries a charge of 27 grains of powder.

Quite recently Mr. Webley has brought out a new self-extracting revolver, with the joint and top fastening of such solidity that over 100 rounds of the American cartridge, containing 3.76 grains of powder and 250 grains of lead, has been fired from it without inconvenience to the marksman or damage to the weapon.

Fouling.—Before breech-loaders were invented, fouling was a serious drawback to the efficiency of the revolver, and many systems of lubrication by Tranter and others were tried to surmount this difficulty.² It has now been altogether overcome by the employment of a lubricant contained in the cannellures of the bullet, which may consist of tallow or Japan wax.³ A Colt's revolver has fired 300 rounds with American Service ammunition, being allowed to cool after each 100; no difficulty was experienced in firing it. The revolver was then laid in the snow, water poured over it, and it was allowed to remain in the weather three days and nights. When taken up again it was rusted considerably, but worked perfectly.⁴

¹ Major McClintock's experiments.

² Greener, page 427.

³ United States, Springfield Report, 1882.

⁴ Extract from American Government Report on trials with breech-loading revolvers.

Fouling of the Pin of the Cylinder.—In the earlier types of self-extracting revolvers it was found that after firing a certain number of rounds, the gas escaping between the cylinder and the barrel fouled the pin of the cylinder to such an extent that the cylinder would not revolve. This difficulty has now been successfully overcome by Mr. Webley and others, and a self-extracting revolver has fired over 300 rounds without a sign of fouling.

V.—*Rapidity of Discharge.*

With regard to rapidity of fire, it must be remembered that a non-extracting double-action revolver can be fired as rapidly as a self-extracting revolver for the first six rounds; but when the reloading question comes in as part of the attainment of quick fire the latter weapon leaves the former hopelessly in the rear.

Whether the facility afforded for quick loading by the self-extracting revolver is of the value it appears to be at first-sight seems to be doubtful. There are few cases, looking at it from a military point of view, when six shots would not be sufficient to settle the affair one way or another.

Again, though a self-extracting revolver takes very little time to reload, still it does take time, and it appears probable that that delay would in most cases be as fatal to its possessor as the rather longer period taken by the non-extracting weapon.

It has been stated that a self-extracting revolver can, by being placed in the holster, or stuck in the coat-front, be rapidly recharged with one hand while the marksman is proceeding at a gallop; of course, if this can be done, it is a point in favour of the self-extractor.¹

Colonel Maitland, R.A., writing from Turkish headquarters in 1878, says: "The revolver carried by the Circassian body-guard is a serviceable weapon. It opens at the breech on a hinge, and is so contrived that the action of opening throws out the empty cases; the barrel is then thrust, muzzle downwards, into the breast, the hinge remaining open; fresh cartridges are placed in the chamber. The breech is closed sharply by a snap. The pistol is then withdrawn ready for use. All this can be done at full gallop with one hand in a very short time."

The time taken by expert marksmen to fire and reload non-extracting revolvers is also short. Eighteen rounds have been fired, commencing and ending with chambers empty, in 1 minute 54 seconds, with a Colt revolver.²

It is not the extracting apparatus which oftenest renders a revolver unreliable, it is the failure of the cylinder to revolve properly. Many Officers on this account prefer the double-barrel pistol for active service. For the Afghan and Egyptian campaigns nearly all the Officers of the 10th Hussars armed themselves with these pistols instead of revolvers.

¹ "Encyclopædia Britannica."

² Springfield Report, 1882.

Reasons why the Cylinder sometimes fails to rotate.—The failure of the cylinder to rotate will generally be found to be due to one of two causes:—first, faulty construction in the revolver; second, faulty construction in the cartridge.

In the first case, when revolvers jam it is due to the ratchet not being properly hardened. This wearing of the ratchet is so well recognized that I find in Dean and Adams' description of their revolvers the following:—"The toothed ratchet is secured to the base of the chamber by two screws, so as to admit of its being renewed when it becomes abraded by use."¹

A good ratchet, however, will last a long time; over 5,000 rounds have been fired by a Wilkinson's extracting revolver before the ratchet showed any signs of wear.²

The ratchet in American revolvers appears to be flatter, stronger, and more deeply cut than those employed in England.

The hand or pawl has also two fingers in place of one, the second finger taking hold of a second tooth, and greatly assisting the revolution of the cylinder.

Another cause which sometimes accounts for the non-rotation of the cylinder is the wearing of the pawl or lifter, which shortens it and prevents it working properly.

A cause of miss-fire is the wearing of the striker, which of course shortens it, prevents its reaching and exploding the cartridge.

In the second case the butt end of the cartridge is sometimes accidentally elongated, and this catching in the breech piece prevents the cylinder revolving. Sometimes a paper coating is placed within the metal case of the cartridge, and this on discharge gets wedged between the cylinder and the barrel, causing them to jam. There were instances of this in Egypt.

Besides the complete jamming of the cylinder, miss-fires occur from the cylinder rotating either too far or not quite far enough, the hammer in these cases striking either behind or before the cap.

The weight of the loaded cartridges when two or more chambers have been discharged will sometimes thus drag the cylinder over.

Of course much greater rapidity can be obtained with a double-action revolver fired continuously, that is, without cocking, but by simply releasing the trigger after each discharge, than with the same weapon when fired at single practice, that is, when cocked by the thumb between each round. And there are times when this rapid firing may be of the utmost importance.

But care must be taken to guard against rapidity taking the place of accuracy; it is much easier than most people think to miss a man, even at 5 or 10 yards; the smoke alone after three or four rounds will often completely obscure the view.

Advantage of Continuous over Single Practice.—A great advantage which continuous practice has over single is that it enables the revolver to be discharged repeatedly with one hand with great ease. Thus an Officer may have his sword in his right hand, and yet fire

¹ Greener.

² R. M. C. Range.

his six barrels with his left; if mounted, he can hold his reins in his left hand and empty his revolver with his right. It is curious how little difference single or continuous practice makes in point of accuracy.

In the Musketry Regulations it is laid down that single practice should be the rule, continuous practice the exception, and this is now carried to such an extent that there is no continuous ball practice in the non-commissioned officers' course, although it was very strongly recommended that there should be.

My experience goes to show that continuous practice should be the rule, single practice the exception; when I say this, I do not mean that the revolver should necessarily be fired rapidly, indeed a steady aim should always be taken, but that continuous practice should be generally used even when time is no object.

My reasons for this are, first, that I consider continuous practice far more useful for an Officer than single practice; the latter would only be used for long shots, which would, in many cases, be better left unfired. Second, the most probable times when a revolver would be of use to an Officer would be at close quarters to repulse, or protect himself from, a sudden rush of the enemy. In this case continuous practice would be the order of the day. Third, continuous practice is more difficult to learn than single, and therefore should be more studied. Fourth,—after a short time, as good, or almost as good, shooting may be made with continuous as with single practice. In an account in "The Field," of some interesting revolver experiments made at Nunhead (on 28th March?) by Mr. Webley, his single practice at 12 yards was not so good as his continuous at the same distance.

Mr. Webley professes to be able to make as good shooting with continuous practice as at single; and I have come across many cadets who can do the same.

At these same trials Mr. Webley fired, continuous practice, forty-eight shots in 3 min. 5 sec. (with a self-extracting revolver), all but four shots striking within a square foot; range, 12 yards. Curiously enough, on the 9th April, Mr. Ira Paine, at the same place, under the same conditions, with a solid frame Colt, fired 48 shots in 2 min. 15 sec., but his diagram was not so good as Mr. Webley's.

When several shots have to be fired at an advancing target, I believe better shooting can be made continuously than when cocking after each shot, the disadvantage of the heavier pull in the former case being more than balanced by the advantage gained by keeping the eye constantly fixed on the target, and the revolver pointed more or less the whole time in the same direction.

Left-handed Shooting.—The importance of left-handed practice must be mentioned; to a beginner it will appear that shooting with the left hand is extremely difficult, but this is by no means the case; with a little practice, almost as good shooting can be made with the left as with the right hand, and the advantage of being able to do this must be apparent to all. It is urged that it may be very true with regard to the infantry Officer, who would

naturally, if a good shot with his left hand, carry his revolver in his left and his sword in his right, but that a mounted Officer would always have his reins in his left hand, and therefore only have his right available; but there are cases, a hard-pulling horse for instance, or an enemy close on the near side, when the power to shoot with the left hand would be of value. Sir Richard Taylor, K.C.B., writes: "The proposal that Officers should be instructed in the use of the revolver is one that in my opinion is well worthy of consideration, as there may occur many occasions on active service when proficiency in the use of that arm may be most useful. It is a mistake to suppose that a revolver can be used effectively without some amount of practice and tuition. I would also advocate that the use of the weapon should be taught with the left as well as the right hand."

A Staff Officer now serving in Egypt also writes: "I certainly think Officers should be instructed in revolver shooting as part of their training; they ought to be so, to enable them to defend themselves and also to accustom them to handle revolvers, and then we should not have so many accidents with them. I have been accustomed to shoot with revolvers and pistols ever since I have been in the Service, and made a point of making myself a fair shot. Every Officer should be able to shoot with his right or left hand as occasion requires."

The following incident is taken from Denison's "History of Cavalry":—

"In the battle of Saitshar, a Servian Officer, Captain Frassanovitch, distinguished himself greatly. He took his sabre in his teeth, and, revolver in hand, charged through a Turkish demi-battalion, captured the colours and carried them off, leaving a dead or wounded Turk behind him for every barrel of his weapon."

VI.—Accuracy.

It is difficult to lay down a cut-and-dry law with regard to the accuracy of the revolver, so much depending on the powers of the marksman. The Volunteers have lately seen the importance of accurate revolver shooting, and last year there was a revolver competition at Wimbledon for the first time. The attempt, notwithstanding some drawbacks, which will always attend a new venture, proved a great success, and is to be followed by a competition on a larger scale this year. The accuracy of the shooting, however, left much to be desired.

There is no doubt that the best revolver practice of the present time is far inferior in point of accuracy to the pistol-shooting of our fathers; partly this is no doubt due to the weapon; most revolvers are badly balanced, the better ones in this respect, such as Colt's Frontier, having too long a barrel for convenient portage.

Again, in the old duelling pistol, and in the modern rifle, the recoil acts more or less directly in a line with the hand or shoulder, whereas in the revolver it acts considerably above the hand, thus giving the

weapon an upward jerk, which, though perhaps not affecting the accuracy of the first shot, tends certainly, from the strain on the wrist, to impair the accuracy of those that follow.

Want of Interest in Revolver Shooting.—What perhaps is the chief cause of the poor, nay wretched, revolver shooting of the present day is the little interest taken in the subject. The old saying that "practice makes perfect" holds good in revolver shooting as well as in other matters, and, unless we can induce our Officers and others to exercise themselves in the use of the revolver, there will be little good in attempting to improve the defects of the weapon.

What may be done by a practised marksman, the following extract will show:—

"On Friday last we went by invitation to Nunhead to see Mr. Ira Paine demonstrate what a good shot can do with a revolver. The day was anything but favourable, the light being gleamy and dazzling, and a north-east wind blowing in powerful gusts from left to right across the range. Mr. Paine stood in a hut which offered some little protection from the wind, but the full flight of the bullet is across the open. The targets used were the ordinary cartons, with a bullseye $4\frac{1}{2}$ inches in diameter. The distances were measured by us. The first practice was at 12 yards, the weapon being a Colt's short army revolver with a barrel $5\frac{1}{2}$ inches long, taking Eley's 0.450 cartridge. The first shot struck the bullseye about half an inch low from the centre, the second was a dead centre, the third a quarter of an inch low, the fourth one-eighth inch low, the fifth three-eighths of an inch low, and the sixth one-third of an inch low on the right, all being bullseyes. In short, the number of shots fired was fifty, and resulted in forty-two bullseyes.

"The wind blew the target about so that, on our suggesting it should be fastened in some way, Mrs. Paine stepped forward, and, taking hold of one corner, held it steady. Under favourable circumstances, it is fair to suppose that every shot would have been a bull.

"The next arm used was the 'Frontier,' having a barrel $7\frac{1}{2}$ inches in length, and taking the 0.44 calibre Winchester Repeating Arms Company's cartridge.

"The first shot was a bull 1 inch low from centre, the second one-fourth inch right, the third one-eighth inch high, the fourth one-eighth inch left, high, the fifth an outer, the sixth (a careless shot) 2 inches high. All bulls but the fifth.

"Twenty-five shots were altogether fired, of which twenty-three were bulls. At 25 yards with the short Colt Mr. Paine made eight splendid bulls and seven outers, four of which were within half an inch of the bull.

"The exhibition closed with the 'Frontier,' at a third-class firing target, with a bullseye 2 feet by 9 inches.

"Distance 100 yards. Six shots were fired. The first was a bull 2 inches low, right; the third 4 inches low, left; the fourth, outer, left, 3 inches from bull; the fifth an outer, left, half an inch from bull; and the sixth a bull, 2 inches low, left. This is splendid

¹ "Shooting Times," April 25th, 1884.

shooting, and we regret exceedingly that the adverse conditions of the weather should have so interfered with this wonderful record."

At the last Wimbledon competition the best shooting record was made with an Enfield revolver, thirty-four points having been made out of a possible thirty-six.

But, notwithstanding the drawbacks in construction, it may be safely stated that in the hands of an ordinary practised marksman a revolver will put every bullet within a target 1 foot square at ranges varying from 10 to 30 yards according to proficiency, and this for all military purposes would appear to be sufficiently accurate.

Drift.—The twist of the rifling being to the left, the drift is in the same direction; it amounts to about 30 inches at a range of 300 yards. For distances under 150 yards, however, the pull on the trigger, acting in the opposite direction when shooting with the right hand, serves to neutralize the drift; when shooting with the left hand allowance must be made for their combined effect.

Construction of Butt.—It is curious to notice the different shape of handle adopted in most English revolvers as compared with that in general use in the United States. The handles of the former are of almost uniform thickness throughout, while those of the latter increase considerably in circumference towards the butt. Opinions and tastes vary considerably with regard to the best form of butt. In considering the subject, the two most important points to be remembered are—1st, Which butt affords the best grip? 2nd, Which sort of butt conduces most to lessen the effect of the recoil? An English saw-handled butt no doubt gives the firmer grip, while the American, on the other hand, reduces the shock of the recoil by allowing the pistol more play.

Simplicity of Construction.—Simplicity of construction is of greater or less importance in a military revolver in proportion with the intelligence and attention of the possessor. To be of any value, nay, not to be rather a danger, a revolver of any description must be thoroughly understood.

Knowledge of the Mechanism of Revolvers necessary.—A friend of mine was ordered in 1879 suddenly on transport service from Lucknow to Kabul. He had no revolver, but, thinking one necessary, he borrowed his Adjutant's. Some time elapsed before he had either time or occasion to try it. Fortunately for him, an opportunity of a peaceful nature came in his way. Passing along the Kurram Valley with his train, he one day observed a fox, which, with sad sportsman-like instincts, he proceeded to stalk, and, on arriving within 20 yards of the intended victim, he began to open fire with his revolver, but, as perhaps was not unnatural, he could not succeed in getting off a round. A second attempt in camp not proving more successful, he returned the weapon to its owner, who, we will hope, if he takes it with him on service, will have better fortune. My friend then purchased a revolver, supposed to carry Government ammunition, and, being warned by experience, practised with it in camp. After the relief of Sherepore he took it with him when he went to assist in clearing the surrounding villages. In one of these he found some

Afghans, on whom, at about 20 yards, he fired six rounds, without, as far as I could gather, much result. He then proceeded to reload, and found to his dismay the ammunition he had purchased with the revolver had been expended, and the Government ammunition would not fit his new purchase. Fortunately the Afghans retired in one direction, and allowed him to perform a like movement in the other.

So much for an Officer not knowing the construction of, and failing to test the service ammunition with, his revolver.

It may appear to some that my friend's conduct showed negligence. In as far as not being in possession of a revolver and knowing how to use it directly he entered the Service, I think it does; but then my friend is not an isolated instance of this; indeed, the chief aim of this lecture is to point out how necessary it is for all Officers to possess and to know how to use a revolver.

After my friend got his orders he had neither time (getting his orders one evening and starting the next morning) nor facility to purchase a good revolver nor to study its construction.

Double-barrel Pistols.—The simplest form of weapon is the double-barrel pistol, and should be purchased in preference to the revolver by those who have not time or opportunity to study the construction of the latter.

Lieut.-Colonel Brabazon, 10th Royal Hussars, writing on double-barrel pistols, says:—

"I can only say that I infinitely prefer a double-barrel and breech-loading pistol carrying a heavy bullet and with a simple loading action to a revolver, I have seen so many lives jeopardized through reliance being placed in revolvers stopping a man. This a revolver seldom does. I could enumerate many cases, some of which have come under my own personal observation, and in one case where I myself was nearly being the victim of confidence placed in a revolver, when the revolver, though hitting the man aimed at, failed to stop him.

"The action of most revolvers is complicated, easily getting out of order and very difficult to keep in order. Once empty, you have not time to load them in action.

"At El Teb I nearly lost my life through my revolver jamming. I rode at a man, and my revolver (one served out to us from H.M.S. 'Jumna'—a navy revolver) would not go off.

"This is not the first time I have seen this happen to others, and once before, in Afghanistan, it happened to myself. These are my objections to a revolver and my reasons for preferring a pistol.

"1st. The revolver bullet is too light and the charge too small to stop a strong man unless you happen to hit him in a vital part.

"2nd. They easily get out of order.

"3rd. They frequently jam.

"4th. They take a long time to load.

"5th. You have to take them to pieces to clean them.

"6th. They are very difficult to make good practice with as they throw very high.

"7th. One must be in a very bad way if you want to fire more than one or two shots.

"8th. As a rule one does not reload until all the chambers are empty, and then you may not have time to do so. You are also very liable to be left under the circumstances in a position when you want at least a couple of shots while you have only one barrel loaded.

"A pistol carries a heavier bullet and efficaciously stops your man. Lieutenant Lord Airlie told me he owed his life at Abu Klea to my having given him one of my pistols with which he shot the man who wounded him; he dropped him dead.

"It is handier and comes up better than a revolver and makes much better practice. With simple breech-loading one can easily pop in a cartridge; it does not take a second. In fact, pistols are much easier cleaned and kept in order, carry a heavier bullet, really stop a man, handier to carry and to use, make better practice, and are in my opinion in every way preferable to a revolver."

Next in order of simplicity comes, I think, revolvers of the type of Colonel Colt's cavalry pistol. I purpose to describe this weapon in detail later on. It has a solid frame, and its mechanism is very simple, but, being only single-action, it has not the advantages of such weapons as our English double-action self-extracting revolvers. Weapons of this latter class are more complicated, and require more time to understand and more care to keep in working order.

Penetration and Stopping Power and Calibre.—Penetration and stopping power must not be confused with each other; the former depends principally on the striking velocity of the bullet (the striking velocity depends on the range and the quantity of powder used). Stopping power probably increases or decreases in proportion to the calibre of the bullet. It must be remembered that a bullet of small calibre travelling with great velocity is likely, not only to penetrate, but also to pass through an antagonist at short ranges, and as soon as this happens the energy yet remaining in the bullet is wasted. When the Henry-Martini is fired at 500 yards range, its effect in knocking over a weight is about the same as when fired at 20 yards range, showing the stopping power at both ranges to be about equal. Of course an express bullet has great velocity and also great stopping power; but this is due, not to the velocity in itself, but to the shape which the velocity causes the bullet to assume on striking. It is difficult to determine how the weight of the bullet, irrespective of its shape, affects its stopping power. It may be assumed that the greatest possible amount of stopping power can be attained from a revolver which has the largest calibre compatible with sufficient velocity to penetrate without passing through an antagonist.

Colonel Barrow's Opinion of the Government Revolver.—An Officer of the 19th Hussars writing from Egypt says: "As to the efficacy of the revolver, opinions are divided, but in the main strongly against it. Barrow used to get very warm on the subject, and thought the present weapon perfectly useless against Arabs, as the shock is not sufficient to stop them in their charge unless you are lucky enough to hit them in a vital spot. I remember he used to say that he would

as soon go into action with a pop-gun; and he carried (as do many others) one of those four-barrelled pistols of Wilkinson's, a much heavier weapon, the shock of which would bring down a bullock."

On the other hand, "At El Teb an Arab was cutting down one of our fellows, when a farrier shot him dead so clean that the sword just cut through the man's scalp, and that was all. It would seem from this that, if a fellow takes the trouble to practise, he can make a very useful and reliable friend of his revolver: but at the same time there is no doubt that it is susceptible of several important improvements, especially in the way of carrying a heavier bullet. I saw Besant, of the Egyptian Army, attacked by a dervish, who fired at him, grazing his arm; Besant emptied two chambers of his revolver at him, missing him, but shot him through the head with the third, killing him on the spot."

After Ulundi a Zulu showed Major Windham two wounds in his neck and shoulder that were made by an Officer's revolver at Isandlana; he said that two of his comrades had fallen dead, but, notwithstanding his wounds, he succeeded in assegaiing the Officer.

A gentleman writing from America says: "I knew many cases during my sojourn amongst the wild mining population of California where the man first shot was quite able to inflict a mortal wound on his assailant, although he subsequently died from the effects of the shot, and one case where the man so wounded killed his three opponents before he died from their bullets. These and other examples of a like nature show what an important qualification stopping power really is in a revolver. When a man is struck by the rifle bullet he has in most cases many yards to travel before he can reach the marksman; with the revolver he is close at hand."

Necessity for Accurate Aim.—Perhaps the best method of supplying this want of stopping power is to instruct the marksman so that when he fires, his shot may prove fatal. Practice makes perfect, and with a little trouble any man with ordinary eyesight can succeed in achieving this at 15 yards, a good shot at 20 or 30 yards, or even greater distances.

The stopping power depends, therefore, more on the proficiency of the marksman than on the bore of his revolver, and every one should determine for himself his stopping power range, and reserve his fire until certain of striking home. Of course the stopping power of a revolver could be increased by adding to the weight of powder and ball and increasing the calibre of the cartridge.

Relative Charges of Powder in England and America.—On this point there seems to be a difference of opinion between our own and the American authorities. With us 18 grains of powder and 265 grains of lead are considered the maximum charge admissible for the Service revolver. In America, on the other hand, they are of opinion that no inconvenience whatever attends the use of cartridges containing 37.6 grains of powder and 250 grains of lead.¹ It is possible that our authorities have been led to adopt the lighter charge more with regard to the strength of the Service pistol than on account of

¹ American Ordnance Notes, June 30th, 1876.

the recoil, the solid frame of the American pistol being more adapted to resist the shock of the exploding charge than the jointed frame used in our Service.

F. R. M., writing in the "Field," February 2nd, 1884, says: "Colt's Frontier revolver, weight 2 lbs. 8 ozs., takes 200 grains of lead propelled by 40 grains of powder. The Enfield, like most military revolvers, is 2½ lbs. in weight. Now, if an 18-grain charge is thought sufficient, it does not require a very profound reflection to arrive at the conclusion that a pistol of less than half that weight would do the work. If, on the other hand, we are to have a pistol weighing 2 lbs. 8½ ozs., let us have a 250-grain bullet and 40 grains of powder, and we shall have a weapon shooting with such force and precision that a moderately good shot, resting the barrel, never need miss a man at 200 yards. This is the style of tool with which you hear of Western frontier men killing deer at 150 yards, and it is so good that we might give it to artillerymen and take away the carbines, which would be pretty sure to be strapped up out of reach in case of sudden surprise by hostile cavalry. Of course civilians buy what pleases them, and must take the consequences if they do not make a judicious choice; but it is much more serious when those who are responsible for the national armament fall into such error, as I believe they have done in the matter of the Enfield revolver."

Recoil.—The recoil of most military revolvers is about a quarter that of the Henry-Martini, and when it is remembered what a severe kick a Henry-Martini will give if not held close, it will be seen that a considerable strain is brought on the hand and wrist by rapid revolver shooting.

VII.—Range.

Little need be said of the range of the revolver—perhaps the less said the better, for as far as military purposes are concerned it should rarely be employed beyond close quarters. There are cases, however, when long range shooting may prove advantageous even to an Officer, for instance, in endeavouring to capture despatches, or to disable pursuers.

It is well, therefore, that we should know what can be done in this way at a pinch. In experiments made on the Royal Military College range, it has been found that a fair pistol shot can, as a rule, with a Wilkinson revolver, place every bullet within a 6-foot square target at ranges up to 150 yards, and this target may be taken to represent a horseman. Mr. Ira Paine,¹ said to be the best revolver shot in the United States, has repeatedly put six shots running into the target of a man at 100 yards' range, and I have seen cadets make almost as good practice at a like distance.

The range of the revolver depends principally on its muzzle velocity, though the form and weight of the bullet affect it in a minor degree.

Sighting.—*Flight of Bullet affected by Recoil.*—With the rifle, the axis of the barrel at the time of firing and at the instant when the

¹ Walsh on "Revolvers."

bullet quits the muzzle are nearly coincident, but with the revolver this is not the case, owing to the recoil, acting along a line *above* the point of resistance, throwing the muzzle up. The direction of the bullet being determined by the position of the axis of the barrel at the instant it quits the muzzle, it is necessary to so arrange the sight that the proper elevation is given to the axis of the barrel, not at the moment of pulling the trigger, but at the instant when the bullet leaves the muzzle. A revolver correctly sighted to fire from a fixed rest will, when fired offhand, throw high.

In the case of a rifle the axis of the barrel produced passes above the line of sight, but in the case of a revolver, up to a range of about 270 yards, the axis of the barrel at the moment of pulling the trigger is below the line of sight, and this is because before the bullet leaves the muzzle the barrel is rotated upwards, until the axis of the barrel is sufficiently far above the line sighted for the object to be struck (Fig. 7). Of course the amount of depression to be given to the axis of the barrel depends on the length of the barrel, the charge of powder, the weight of bullet, &c., and can only be found by experiment. The angle of depression for 50 yards' range for the American cavalry revolver¹ has been carefully worked out, and is found to be $1^{\circ} 14' 24''$. This is found sufficient with the fall of the trajectory to cause the bullet to strike the object aimed at. At 150 yards, however, it will be necessary to aim about 4 feet, and at 200 yards 8 feet, above the object to be struck.

In many revolvers the *v* of the back sight, though good for fine shooting, is cut too deep for quick aiming; the rounded fore sight of most revolvers is often difficult to distinguish; many good shots therefore prefer a flat fore sight.

A very good system of sighting is to have a bright triangular piece of metal let into the pistol just below the back sight, the sharp angle of which at once catches the eye and fixes the centre of the notch.

Bright Fore Sights.—Bright fore sights on revolvers, in contradistinction to the dark ones used on rifles, are perhaps to be preferred, as they are more readily seen, and enable a more rapid sight to be taken. Colonel Silver's ivory fore sight appears to be the best.

Military Revolver sighted for 50 Yards.—In the Musketry Regulations it states that military revolvers are sighted to shoot accurately at 50 yards. The advantage of this seems to be very questionable; putting aside the fact that the revolver is used nine times out of ten at close quarters, the tendency of all marksmen, especially when hurried, is to take rather a fuller than a fine sight. It is probably on account of this 50 yards sighting that marksmen find that their bullets generally strike high.

A good revolver shot will often discover, on purchasing a new revolver, that his shots go high or low, to the right or to the left; this is owing to the position of the fore sight, and can be easily remedied by having the fore sight raised, lowered, or inclined to the right or left.²

¹ "United States War Office Report on Revolvers," 1884.

² Major McClintock on revolvers, "Royal Artillery Journal."

Revolvers are not fitted with movable back sights; therefore, in long-range shooting, allowance must be made for the fall of the bullet by aiming well over the object to be hit.

Some revolvers are made with the fore sight attached by means of a screw, and by removing this screw and substituting a different fore sight a point-blank aim may be taken, but this expedient does not recommend itself as practical from a military point of view.

Cleaning.—It may almost be said that to be able to clean a revolver is as important as to be able to load it, for certain it is that unless properly cleaned it will sooner or later either jam or get out of order in some other way.

The arrangements in all first-class revolvers for cleaning are by no means complicated; they, however, require some study, but with a few lessons and some practice they may be easily mastered. The chief point to be learnt is to take the weapon to pieces and put it together again.

In the Musketry Regulations of most Continental armies, more particularly the French, very complete instructions are given for taking the revolver to pieces, cleaning it, and putting it together again. These necessary instructions appear to be wholly omitted from our Musketry Regulations.

Leading.—Leading occurs in the barrels of revolvers from the manner in which they are rifled. Deep sharp grooves are likely to lead. A leaded barrel may be cleaned with mercury.

Facilities for cleaning English Revolvers.—Before quitting the subject of cleaning, attention must be drawn to the advantages possessed by most of our English revolvers over many of American make. In the former no screws or separate fastening pins are employed; to remove the cylinder for cleaning, all that has to be done is to open the revolver and press a thumb-piece. In many of the latter a small screw has to be taken out, which is very liable to be lost, and to remove which a turnscrew or knife is required.

VIII.—*Safety to the Firer and his Friends.*

First, with regard to safety to the firer, a fertile source of danger is the liability that self-extracting revolvers have of going off without being properly closed.

Captain Burn-Murdock's revolver went off in this manner during the Nile Campaign, wounding him slightly in the face, and rendering the weapon unserviceable. He was fortunately able to borrow a second revolver, which served him in good stead at Abu Klea.

Reliable Quality of Materials important to Safety.—Again, the liability to accident will depend greatly on the quality of the materials of which the revolver is constructed, and the care with which they have been put together.

A revolver should not be offered for sale by a first-rate gun-maker until it has been thoroughly tested as to material and workmanship.

Some marksmen, to steady the weapon, raise the left arm and rest

the barrel of the revolver upon it. This plan cannot be adopted without risk, owing to the escape of gas between the cylinder and the barrel, which will sometimes burn the coat and arm.

A marksman must be careful with a strange revolver to see that it does not go off when at full cock before he pulls the trigger; a day or two ago there was a case of a revolver which could be discharged from full cock by a slight shake of the wrist.

Manner of carrying the Revolver.—Secondly, with regard to the safety of comrades. Their safety depends not so much on the revolver, as the manner in which it is carried and held. The safest way to carry a revolver, as far as the bearer is concerned, is in a belt at the back; it is more quickly drawn when thus carried, and this is the plan generally adopted in the United States. The revolver may also be carried on the hip. The belt which holds the revolver case should be fitted with leather cartridge carriers. A small purse on the inside is also convenient for money or other valuables. On service a lanyard should be attached to the handle of the revolver and then passed round the neck, so that if the revolver be dropped it can be easily recovered; this is very important in the case of mounted men. On horseback the safest and most convenient manner of carrying the revolver is no doubt the holster pipe; still this is not to be recommended. The chances of a rider and his horse parting company, either by accident or design, have to be taken into account, and, as the separation might take place at a critical moment, the balance of opinion is in favour of the revolver being part of the man's equipment rather than that of his horse.

Mr. Stanley in his African wanderings fitted a rough stock to his revolver, and carried it suspended from his shoulder between his arm and his side. He found this method very convenient for rapid use, the fact of the stock being pressed to the shoulder when firing considerably assisting the aim. General the Hon. W. Feilding has also borne testimony to the advantage of this plan.¹

Chief Causes of Accidents.—Revolver accidents chiefly happen when the weapon is held in the hand preparatory to use. It was thus that Colonel Gonne, 17th Lancers, and Colonel the Hon. C. H. Lindsay, St. George's Rifle Volunteers, were both accidentally wounded, curiously enough, both in the same place, the thigh, while superintending the practice of their corps. In nine cases out of ten these accidents are due to want of knowledge of the mechanism of the weapon, and therefore a hard and fast rule should be laid down that no loaded revolver should be handled until its construction and action are thoroughly understood.

Writing on this subject from Egypt, Colonel Murray says: "If the man is not accustomed to handling a revolver it is a most dangerous weapon, and in a *mêlée*, if a man gets excited, he may just as easily shoot a friend as an enemy."

Again, Colonel the Hon. P. Methuen writes: "I consider the revolver most dangerous for anyone but the enemy. In my short Cape experience one bullet went through an Officer's tent, over the

¹ Feilding on "The best Outfit for Exploration," 1885.

Quartermaster's head, and eventually attracted attention in an adjoining camp. This was from indifferent handling during cleaning. A man had a bullet lodged in his leg at the range of one yard; this was from a man showing off the admirable mechanism of his revolver, not knowing it was loaded. A similar accident happened on board ship going out to the Cape.

"Another time Colonel Cotton told me of an Officer who went through the pistol practice necessary for shooting your opponent through the head in a duel. I suppose the pistol went off rather after its time, for the bullet went through the deck, and nearly did for the First Lieutenant in his cabin.

"These are all instances of accidents occurring from gross ignorance, and I for one feel uncomfortable when my friends for the first time on board ship ask for target practice with their new revolvers, 'just to see what they are like.'"

The Colonel of a Highland regiment on passage out to Egypt in 1882 was heard to remark: "What I funk is not the Egyptians, but the subalterns' pistols."

The only means of getting a man to be steady in using his revolver is to make him a thoroughly good shot with it up to at least 30 yards, and then, when he has confidence in his weapon, he will not fire at random, but will take care he shoots the man he intends to, and no one else. With a man not accustomed to a revolver, the very knowledge that he has six barrels, or rather shots, to fire off tends to make him unsteady, as he thinks, if he misses with the first, he is sure to hit with one of the others, so that it does not much matter about aim. A steady pistol shot, on the contrary, makes sure of each shot, perhaps from mere habit.

A great source of danger, both to the firer and bystanders, is the difference in pull-off in the same revolver when fired continuously or in single practice. I have myself on two or three occasions seen a revolver go off accidentally from this reason. The most careful shot is liable at times to forget the difference between the pull-off of the continuous and that of the single shot. The only way to guard against accidents of this sort is to insist on the revolver being always held (except while taking aim) with the muzzle pointing downwards. On some ranges a mechanical contrivance, Fig. 4, is employed, which ensures the revolver being kept in this position.

Safety Stops.—There is a simple arrangement to be found in the revolvers of the Royal Irish Constabulary and others, which enables the weapon to be rendered perfectly safe for portorage. It is a small thumb piece attached to the base of the hammer, which, on being turned, locks its action. The objection to this catch or stop appears to be that the marksman is liable to forget that it has been applied, and on attempting to fire without releasing it finds to his surprise, and may be horror, that his revolver will not go off.

Colt's revolvers have a safety notch, on which the hammer rests before it comes to the half cock, and the pistol should always be carried with the hammer resting on this notch.

Rebounding Lock.—English revolvers are now generally made with

a rebounding lock. This is a great improvement, as it renders the revolver far safer for portage. Lieutenant Clementson, 19th Hussars, writing last month from the Soudan, says: "Revolvers have an uncomfortable knack of going off at the wrong time and in the wrong direction. Last week, when out with a patrol, my interpreter's revolver, which he was carrying strapped to his saddle, suddenly went off, and killed the camel he was riding, the bullet passing through its spine. This was unaccountable enough, as it was certainly not cocked, and was so placed that he could not have touched it with his foot or anything of that sort."

IX.—*Danger Precautions.*

Danger precautions may be considered under two heads: 1st, the precautions to be taken to guard against accidents in instruction drill and practice; 2nd, those precautions it will be necessary to take when the weapon is being used on active service.

The only way to guard against accidents of the 1st class is to insist upon the strict observance of carefully drawn-up rules.

With beginners it is well that the revolver should be loaded for them by the instructor, who places it in a stand ready for use.

Revolver Stand.—No revolver range should be without this stand; it is made by driving a post firmly into the ground, and then nailing upon it a board, about one foot square, previously prepared with one or more holes to fit the barrels of the revolvers. Its object is to insure the revolver being always pointed towards the ground when not aimed at the target (Fig. 4). The firer, on his name being called, should advance from the barrier and place his hand on the revolver, previously loaded and placed in the stand by the instructor; he should then, at single practice, cock the revolver, while still in the stand, before raising it; if at continuous practice, he should raise it at once and carry the muzzle direct from the stand to the target. As soon as he has pressed the trigger, at either practice, he should lower his hand until the muzzle of the revolver drops into its place in the stand, he should then, without necessarily relinquishing his hold of the weapon, watch his shot being signalled.

Shooting at the running man, the same course should be adopted, with the exception that the muzzle of the revolver need not be placed in the stand after each discharge, but be held pointing at the target until the six shots are fired or the running man disappears.

Barrier necessary on Range.—Across the end of the range, about five yards in rear of the firing-point, there should be a barrier beyond which no one should be allowed to pass except the firer, the instructor, and the superintending Officer.

Safety to the Public.—The safety of a range will depend very much on where it is situated. In most cases the ordinary precautions adopted on a rifle range are sufficient. Where space is an object, as in a town or close to barracks, safety to the public can be secured by the following system (Fig. 5).

The firing-point being fixed as the centre of a circle, the back

screen or butt and the intercepting screens are all described as arcs of circles struck from the common centre, the object of this being that all bullets aimed from that common centre and impinging on any part of the surfaces of either of those screens must necessarily strike at right angles, so preventing the possibility of the bullet glancing away from the spot struck; and, as the screens would be made of iron plates faced with wood there could not be any back splash. Again, presuming that it be desirable to have an 18 feet opening clear from the firing-point to the target, the screens A, A, each having a surface of 10 feet, are so placed as to intercept the flight of a bullet aimed at a point immediately beyond the limit of protection afforded by the butts.

In like manner the screens B, B intercept the bullet as soon as its line of flight passes outside the limit of protection afforded by A, A, and in the same manner with C, C, so that the fixing of three screens on either side gives absolute protection for an entire half-circle described from the common centre or firing-point.¹

X.—*Precautions against Accidents in the Field.*

With regard to precautions which should be taken to guard against accidents in the field, they would appear to be as follows:—

1st. No one should carry a revolver until he is thoroughly acquainted with the method of taking it to pieces, loading and firing it. This ought to apply even more strongly to men than to Officers. But what is our present practice? Drivers of artillery and commissariat are supplied with revolvers on proceeding on active service, no time is then available for training them in its use, and they proceed on service with weapons more dangerous to themselves, their comrades, and their cattle than to their enemies. If fortunate enough to return to England, instead of being allowed time and opportunity to learn the construction and use of their arms, their revolvers are at once given into store. Imagine, gentlemen, a cavalry regiment on home service without sabres, an infantry regiment without rifles, and you will have the position of our drivers of to-day.

Lastly, it should be impressed in the strongest possible way upon all Officers employed directly with troops that the revolver is not intended for *offence*, but only for *defence*, and that of the most pressing nature, and that therefore the revolver should remain in its case except at moments of passing emergency.

Targets.—There are several sorts of targets used for revolver shooting. In Belgium, where they practise constantly, they use lead targets, which travel backwards and forwards on a pair of rails between the butt and the firing-point, thus obviating the necessity for a marker. Paper and cardboard targets are often used. Iron figure targets are, perhaps, the best; they may be painted similar to a third-class Wimbledon target. This arrangement makes the head count only two, which, compared with the five awarded to the bull's-eye, is con-

¹ "Naval and Military Magazine," Oct., 1885.

sidered hard by some, but is not so in point of fact, as the head is as far from the centre aimed at as the knees. Without altering the scoring rings, the target may be painted some natural colour, to represent a man, and this plan is much to be recommended.

The Marker's Butt.—The marker's butt should be about 2 feet from the target, with a stout palisading and plate-glass window, to protect the marker from the splash of the bullet. Holes should be cut in this palisading below the plate-glass window, through which the handles of the discs pass. The discs themselves rest in a hollow in front of the target; the parts of the handles outside the palisading should be hidden from view by a small ramp. Brushes are attached to the reverse sides of the discs to enable the marker to re-colour the target while showing the position of the shots. The advantages of this system are rapidity, as the discs have only a very short distance to travel, and safety to the marker from splash; this latter point is of importance, as many markers have been injured by the splash of the bullet passing through the usual marking slit, on rifle as well as on revolver ranges (Figs. 8, 9).

Running Man.—Besides the ordinary practice at a stationary target, when plenty of time for aiming is taken, it is important that Officers should practise rapidity of fire, and this can be best done by firing at a moving target.

Most moving targets run from right to left, and *vice versa*. This sort of target does not appear to be at all suitable for revolver practice. An Officer should never employ his revolver on an enemy passing across his front, but on an enemy advancing towards him.

The following is a description of the target used on the R.M.C. range (Fig. 9). By means of a rope, three pulleys, a wheel, and a trolley an iron figure target is made to travel up and down the range. To obviate the possibility of the firer taking a pot shot, either before the target begins to move or after it has stopped, the figure is not fixed rigidly to the trolley, but is swung on its centre with the weight so adjusted that, while its normal position is vertical, a slight blow will turn it over. About two yards from the pulleys, nearest the marker's butt, two posts are driven firmly in the ground; on either side of the tramway these posts are connected by an iron bar, sufficiently raised from the ground to allow the fulcrum on which the target swings to pass beneath (Fig. 11). Another post is fixed one yard from the ends of the tramway, nearest the firing-point, with an arm sufficiently long to reach the upper portion of the target.

The manner of working this "running man" target is as follows: It is first run under the bar, which, by forcing the figure into a horizontal position, prevents its being seen from the firing-point. On the word being given to "run up," the marker turns the handle, and as soon as the head of the figure clears the bar it assumes a vertical position. The figure remains vertical until it comes in contact with the fixed arm at the end of the run (A, Fig. 9), when it again swings over into the horizontal position. The reasons for the target starting two yards in front of the pulley is, in the first place, to protect the

marker from splash; in the second, to allow the figure on being drawn up to the pulley to again become upright, so that the shots can be signalled by the marker.

Ammunition.—There are three descriptions of Government ammunition :—

Mark I.—Calibre 0·450; it contains 13 grs. of powder and 225 grs. of lead: it is now used principally in the Navy and on foreign stations.

Mark II.—Calibre 0·455; contains 18 grs. of powder and 265 grs. of lead: this seems to have been an intermediate experimental cartridge.

Mark III.—Calibre 0·476; contains 18 grs. of powder and 265 grs. of lead, and is the present Service cartridge (Fig. 6).

It is difficult to understand why the calibre of the bullet should have been altered from 0·455 to 0·476, the bore of the barrel remaining the same, the striking calibre of the bullet is as before, but a far greater strain is brought on the revolver, as the bullet, before it can pass through the barrel, has to lose 0·026 of its calibre.

Revolvers chambered to take Mark I are useless for Marks II and III, those chambered to take Mark II will take Mark I, but not Mark III. Revolvers chambered to take Mark III will take all three cartridges, but if opened to extract will throw out the live as well as empty cartridges of Marks I and II.

Cartridges should not be allowed to get too old; it is also very important that the exact number of grains of powder for which the pistol is sighted be employed; a few grains more or less making the bullet strike considerably higher or lower than the point aimed at.

An Officer writes from the Soudan: "I don't think the Service charge sufficient or the bullet heavy enough. The Government ammunition is not made carefully, and I have found some of their cartridges difficult to load, although I have the proper-sized revolvers to take them."

The ammunition supplied with the Colt revolver contains 40 grs. of powder and 250 grs. of lead, the recoil not being much in excess of that of the Enfield; the Enfield being the heavier weapon.

In the "Field" of October 18th, 1884, Major McClintock, R.A., Assistant-Superintendent, Royal Small Arms Factory, Enfield, says :—

"It may be supposed that, owing to its large charge, the recoil of the Colt's Frontier revolver is excessive, but this is not so. As a matter of fact, and as shown in the recoil column in the table, the recoil of this pistol is little more than that of revolvers firing the Government 0·455 cartridge: and on account of the balance of the Frontier pistol even this slight excess of recoil is not felt."

Buckshot cartridges have been recommended; no doubt at a distance they would wound many, and at close quarters prove a terrible shock. At night they would be invaluable. Express bullets have also been suggested for use with revolvers. If the powder charge were sufficient to cause them to spread, they no doubt would have great stopping power.

Increased stopping power may be given to a revolver bullet by cutting off the pointed end with a penknife. A bullet treated in this way will penetrate an iron plate on which a conical pointed bullet would flatten.

Experiments have been made which tend to prove that greater accuracy, velocity, penetration, and less recoil, can be obtained with the Service ammunition by using a larger calibre for the barrel than the 0.450 of the Service weapon. Fig. 13 is an exaggerated section of the chamber cylinder and barrel of an Enfield.

The bullet is made in the form of a hollow cylinder, this hollow being partially filled with a clay plug A (Fig. 6); a hollow B is left between this plug and the nose of the bullet.

The cannellures at C, D, E, weaken the bullet considerably.

During some recent experiments with Mr. Wilkinson's ammunition, which is supposed to be the same as the Government, it was found that the bullet on quitting the muzzle of the revolver frequently broke into two fragments at one or other of the cannellures.

This breaking up of the bullet was only discovered towards the conclusion of some long trials of several revolvers and pistols, and, of course, when found out, completely invalidated the trials.

A few rounds of Government ammunition have been obtained and fired without any sign of breaking up, but time has not allowed of an exhaustive test.

XI.—*The Enfield or Government Revolver.*

This revolver weighs 2 lbs. 8 ozs., has a barrel 6 inches long, and carries the Government cartridge, 0.476.

It possesses the following advantages:—

- 1st. It shoots with great accuracy, owing to its careful manufacture.
- 2nd. The cylinder axis, being rigid, serves to strengthen the pistol and prevent the possibility of the cylinder blowing upwards.
- 3rd. The extractor requires no spring.

The defects of the pistol appear to be:—

1st. A difficulty of extracting the cartridges; owing to the rigid cylinder axis, they frequently jam at the base of the pistol.

2nd. The time taken to load. This is quite as long as that taken with the solid frame Colt or Silver.

3rd. The weak joint action. This is to be strengthened in future pistols of the same make.

It has been said that this pistol combines most of the disadvantages of the jointed frame without the advantages of the solid frame system.

Thomas's Patent.—This is a very strong form of self-extracting revolver; the manner in which the cartridges are extracted is very similar to that employed in the Enfield. This revolver has a solid frame; it is tedious to load.

Cogsell and Harrison's Colonial Revolver.—This is a solid frame strong revolver, very like a double-action Colt; it has, however, a smoother pull-off, and a very good arrangement for removing the cylinder.

Mr. Harris, writing to the "Field" upon Messrs. Cogswell and Harrison's Colonial pistol, says:—

"I beg to submit the following particulars of its performance when I was shooting with it this day:—

"Six shots at a card target 12 inches by 10 inches, at fifty paces. Colt's long 0.45 cartridges used. Every shot well within target; greatest distance from centre of card, $3\frac{1}{4}$ inches.

"Six shots at card 10 inches square, 2-inch bull at thirty paces, 0.455 cartridges, one shot in bull, two within $\frac{1}{2}$ -inch of same, rest at $1\frac{1}{2}$ inches, 3 inches, and 4 inches respectively from bull.

"Six shots at card 6 inches square, at twenty paces, Winchester, 0.44 cartridges used. One shot missed target, all others well within square.

"This Winchester ammunition can be used in this pistol in case of emergency, as, although the bullet is a little smaller than the barrel, still it shoots very hard and tolerably straight, as this result shows. With an all-round pistol like this, ammunition can be got for it in any part of the globe. Sixty additional shots were fired, the last being as accurate as the first, and no trace of leading in the barrel. The recoil from the long 0.45 Colt cartridges was by no means too heavy; using both hands to hold the stock insures a steady aim and splendid shooting with this ammunition."

Webley's W.G. Revolver, 1886.—This revolver has a barrel 6 inches, weighs 2 lbs. 8 ozs., and carries the Government ammunition as well as the 0.450. The chief advantages claimed for this pistol are—

1st. That, owing to its large circular hinge and massive breech-fastening, it is practically as strong as a solid framed revolver, and will stand as heavy a charge.

2nd. That by a simple arrangement of two collars fitting into each other, it is impossible for any fouling to reach the spindle on which the cylinder rotates.

3rd. That rapid sighting is obtained by the wide shaped V of the back sight.

4th. That by an ingenious contrivance of the lock the hammer is raised for continuous practice by about half the pull, the other half being thus rendered so light that as good shooting can be made at continuous as at single practice.

5th. That it is impossible to discharge the weapon until properly closed.

The objections to the weapon appear to be—

1st. That it is more complicated than a single-action non-extracting revolver.

2nd. That, with the view of enabling the revolver to fire both the 0.450 and the 0.476 cartridge, the barrel has been bored too small to obtain the best results from the larger cartridge. Of course a purchaser could always have the barrel of his revolver bored to suit the larger-sized ammunition.

3rd. The arrangement for locking the cylinder does not appear to be quite as substantial as might be wished.

*Kynock's Revolver.*¹—The chief peculiarity in this revolver is the manner in which the hammer is raised. This is accomplished by the second finger acting on a second trigger. The advantages of the pistol are—

1st. Its combination of single and double action, which insures great accuracy with rapid firing.

2nd. That the hammer is covered in.

3rd. Its cheapness.

The disadvantages appear to be—

1st. As the weapon can only be kept cocked by a continuous pressure of the second finger, it will not admit of very accurate practice being made with it when time is no object.

2nd. The top-fastening does not appear to be quite solid enough.

Silver.—The "Expert."—This clever invention has been designed with the view of combining the advantages of solid frame revolvers with those of quick extraction; it weighs 2 lbs. 8 ozs., has a length of barrel 6 inches. The advantages claimed for the pistol are:—1st. Its rapid extraction. 2nd. Its solid frame. 3rd. Its light weight. 4th. Its ivory fore sight.

The objections to it appear to be—

1st. That, though it extracts rapidly, it takes longer to load than a jointed framed revolver.

2nd. That the extracting apparatus is more exposed to injury than is the case with the self-extracting revolver.

Wilkinson's Revolver.—This revolver weighs 2 lbs. 8 ozs., has a length of barrel 6 inches, and it is a jointed self-extracting revolver of considerable merit. The advantages claimed for it are:

1st. Its accurate shooting with Government ammunition; this is attained by having the calibres of the chamber, the cylinder, and the barrel suited to 0.476 ammunition, which is not the case with many revolvers.

2nd. It has a very secure form of fastening with a patent safety arrangement, which prevents the possibility of the revolver being fired until firmly closed.

Its disadvantages appear to be:—1st. That, though fully able to withstand the shock of the present Government charge, it is doubtful whether either the top fastening or lower joint would stand the 40-gr. powder charge carried safely by the Webley W.G. 2nd. The ratchet has a tendency to wear.

Wilkinson's revolvers have been subjected to a two years' trial at the Royal Military College, during which time over 30,000 rounds have been fired, and with the exception of an occasional accident to the ratchet they have stood the severe tests put upon them perfectly. The results of this long trial conclusively prove that, provided due precautions are taken, 1st in purchasing, 2nd in keeping in order and

¹ Since this lecture was written, Mr. Kynock has further greatly improved his revolver. This improvement consists in a simple arrangement at the back of the trigger guard which catches the cocking trigger and holds the hammer at full cock until the firing trigger is pressed, thus enabling the pistol to be used at single and continuous practice.

cleaning, self-extracting revolvers may be as thoroughly depended upon as solid frame revolvers.

To show what may be done with this revolver when fired rapidly with trigger action by a good shot, I have here a target 1 foot square on which are forty-eight hits, only ten of which are outside a 6-inch centre. The range fired at was 20 yards, the time taken 4 minutes 52 seconds, number of rounds fired forty-eight.

Colt's Revolver.—Colt's United States Cavalry Revolver. This revolver weighs 2 lbs. 5 $\frac{3}{4}$ ozs., it has a barrel 7 $\frac{1}{2}$ inches long, it is single-action, calibre 0.45 inch.

Its chief advantages appear to be its solid frame, its simplicity of construction, and its accuracy of fire at long ranges. It not only takes its own ammunition of 40 grs. of powder and 250 grs. of lead, but it will also take the three Marks of our Government cartridge.

When its own ammunition is used with it, its penetration is double that of the Service revolver. The defects of the weapon are, first, its length, 12 $\frac{1}{2}$ inches, which renders it unsuitable for close fighting; second, it is single-action; third, it is non-extracting.

It compares favourably with the Government and other revolvers in point of weight, being 2 $\frac{1}{4}$ ozs. lighter than the Enfield.

Lancaster's.—Lancaster's pistols are made with either two or four barrels; they possess the following advantages over the revolver:—

Having no projecting parts, they are easier carried; having no hammer, they are safer; they ought to shoot truer than the revolver, owing to there being no escape of gas between the cylinder and the barrel; for the same reason they may be supported on the left arm when firing, which cannot be done with safety with a revolver; they cannot jam; and, lastly, the mechanism, being well protected, is little, if at all, affected by sand, wet, or dirt. These pistols were carried in the Soudan by Officers of the Royal Irish and others who speak very highly of them. The following letter from Lieutenant Whitla, Queen's Bays, is interesting:—

"On reaching my station in India (Umballa), a Gladstone bag belonging to me, containing amongst other things a Lancaster pistol, was stolen from my baggage, and I could not find any trace of the things stolen until *three weeks* afterwards, when a heavy shower of rain washed away part of a mud wall forming the boundary of the riding-school, and the men who were told off to replace it found my pistol buried there. The barrels were, of course, rather rusted, but the lock revolved as freely as ever, and the rust had not penetrated to it at all; in fact, I fired several rounds from it after the *barrels* had been cleared from the rust. I should add that the pistol was found buried without any sort of covering on it. The stock was also slightly eaten by white ants."

These pistols are rather expensive, costing about 8*l.* They are made to carry the Government ammunition, 0.476.

With a view of comparing some of the different types of pistols, Captain B. Barter, the Lincolnshire Regiment, one of the best revolver shots in the Army, and Mr. Kelly, R E., have kindly carried out a series of independent experiments.

Cogswell and Harrison, 0·476 bore, Colt Action.—Very full sight required, which for rapid firing is an advantage, as most revolvers throw high; when in a hurry the firer is apt to take a full sight, in such cases this revolver would therefore carry point blank. Too full a sight, however, is required for very accurate shooting.

Enfield Service Revolver.—The pull-off is good, the weapon appears to me inaccurate and clumsy.

Wilkinson.—A splendid weapon, with very good sighting and pull-off action, rapid and very easy to load.

Sighting, point blank with fine sight. On the whole the most accurate and satisfactory revolver I have tried.

Colt's Frontier.—Too long in the barrel. Trigger too narrow, and stock short and uncomfortable; only one action, and that clumsy.

Kynock's.—I do not like the action of this revolver. There might be a chance of a piece of the flesh between thumb and forefinger being caught and nipped. I found this revolver apt to miss fire.

Lancaster's 4-barrel Pistol.—Has only one action—continuous, very hard pull-off. The sighting of this pistol is very serviceable.

Lancaster's 2-barrel Pistol, Bore 0·577.—Continuous action, only very hard pull-off, and a very heavy weapon. The kick is very great.

Webley.—Very good action, pull-off too light (when cocked) for service. In continuous practice the pull-off is just right. The revolver I fired with carried slightly to the left.

Silver, 0·450 Bore.—The safety action is useful (unless it be liable to get out of order). The sight has a white head which removes the liability of losing the sight altogether by mistaking the metal of the breech for the fore sight, as sometimes happens when both are shiny. Very handy to unload, and action appears simple and not liable to get out of order.

Colt's Double Action.—Good pull-off. Carries very high.

Of all the revolvers I tried, I liked Wilkinson's much the best, combining a good serviceable pull-off both when cocked and in continuous practice. With great accuracy and good balance, it is also the easiest to load.

Next to it I like Webley's and Silver's best, the former on account of the good pull-off in the continuous practice, and Silver's on account of the (white bead) sighting, and of the simple way it ejects the empty cartridges.

Experiments in Rapid Firing by Lieut. Kelly, R.E.—Twelve shots fired with each revolver, time taken over the following operations:—Firing six shots, unloading, reloading, firing another six shots and unloading.

Target was circular, 2 feet diameter. Range, 30 yards; firing as quickly as possible consistent with any aim, almost snap shooting.

Pattern of revolver.	Time.		Hits. Max. 12.	Remarks.
	m.	s.		
No. 1. Wilkinson ..	0	40	10	Fairly easy pull ; a severe recoil, apt to hurt the hand by striking between thumb and forefinger ; appears to throw about 5 inches left and 15 inches high, with full sight.
No. 2. Kynock.....	1	3	11	Sight of this is too thin and hard to see ; the 0.476 ammunition fits very tight, and makes it apt to jam ; it spurts back behind ; throws 10 inches high ; correct direction. I consider the double trigger arrangement the best of all ; it is not liable to unsteady the hand, because the stiff pull is constant and steady, and when the aim is taken a light pull fires. I found this the pleasantest weapon of all for quick-firing.
No. 3. Enfield	1	25	6	The loading arrangement is very slow ; the unloading is clumsy ; cartridges not completely ejected ; the trigger is a long way from the hand, so that only the end of the finger can reach it ; it jammed slightly once ; throws 12 inches left and 24 inches high.
No. 4. Webley.....	1	30	8	4 missfires in 12 shots ; throws 7 inches high ; correct line.
No. 5. Colt, single action.	2	5	9	Appears to throw excessively high—3 feet at least ; rather violent recoil. A single-action revolver is not up to modern requirements.
No. 6. Colt, continuous action.	1	40	7	Very stiff pull ; violent recoil ; throws 12 inches left, 20 inches high about ; the butt is too small for the hand.
No. 7. Cogswell and Harrison.	1	45	11	Easy pull of trigger ; clumsy unloading arrangement ; throws in correct line of elevation.
No. 8. Silver	1	25	9	Has a very good fore sight, an ivory circle ; an easy pull ; but requires special ammunition.
No. 9. Lancaster 2-barrelled pistol.	1	30	3	Very stiff pull ; most violent recoil, which hurts and unsteadies the hand.
No. 10. Lancaster 4-barrelled pistol.	1	10	7	Same as No. 9.

The above does not represent good shooting, as no doubt every shot should hit the target, but I consider that it shows the comparative

values of the revolvers for rapid firing, such as most likely to be required in the field. It is conclusively in favour of those with a light pull, or as in the case of Kynock's, of a stiff pull constant and steady, and a light pull when required to fire. Kynock's trigger and Silver's sight appears a good combination.

America.

The Americans depend very much on the revolver in war. They maintain that it is *the* cavalry weapon *par excellence*. General Lee, writing on this subject, says: "The sword has lost much of its effectiveness by the improved revolver, with which the cavalry man will make the dashing charge with more confidence. My experience was that the cavalry man was timid with his sabre in fighting against the revolver, and for the least excuse will drop the sabre for the revolver. . . . In every instance under my observation the moral effect of the revolver was greater than that of the sabre, the momentum with good cavalry is as readily obtained with the revolver as with the sabre. The revolver is the all-important weapon with the cavalry man in motion, and is indispensable in his equipment."

The revolvers used are Colt's and Smith and Wesson's; the former are, however, superseding the latter. The United States War Office purchase about 1,500 revolvers annually, and since 1879 these have all been of the Colt type:

The Americans do not appear to attach very great importance to the employment of heavy powder charges.

Notwithstanding the fact that the Colt will carry with ease 37·6 grains of powder and 250 grains of lead, the War Office cartridge contains only 28 grains of powder and 230 grains of lead. This is probably due to the Smith and Wesson (a jointed revolver) not being able to stand a heavier charge without injury, and the War Office very naturally are loth to introduce two descriptions of Service ammunition. Still it is six years since the War Office purchased any jointed framed revolvers, and if our go-ahead cousins had considered a heavy charge of much importance they would before this have cast their Smith and Wesson's and adopted the heavy Colt cartridge.

As many Officers and others are at present armed with Colt's revolver, it has been thought advisable to give the following quotations with reference to their mechanical features and manipulation taken from the American Arms Regulations, 1882:—

"Mechanical Features of the Colt.—The frame is made of wrought iron and case-hardened. It encloses the cylinder and is made in one piece, into which the barrel is screwed. The centre-pin bushing affords a third surface of revolution for the cylinder, and diminishes the chances of sticking from dirt or rust. The cylinder and bushing may both revolve on the centre-pin, which in turn may revolve in its own bearings. The double feed-finger on the hand gives two points of contact with the ratchet instead of only one. The finger of the hand moves in the direction of the tangent to the circle upon which the ratchet is cut, and, after rotating the cylinder to a certain position, it passes from the notch of the ratchet, and can no longer act upon it. But, before the first or upper finger leaves its notch in the ratchet, the lower finger begins to act upon the next notch, and thus insures the certainty of the revolution of the cylinder. This form and action of the hand

allows the space between the chambers to be utilized for cutting the ratchet-teeth upon a larger circle, thereby increasing the leverage, and consequently the rotatory effect of the hand upon the cylinder. It also produces less wear upon the ratchet. The hammer has three notches, the safety notch, the half and full-cock notches. The former is the first one felt in cocking the revolver.

"Manipulation—To load the Revolver.—Hold the revolver in the left hand, muzzle downward. Half-cock it with the right hand, and open the gate. Insert the cartridges with the right hand, close the gate, and bring the hammer to the safety notch. Keep it there until the revolver is to be fired.

"To eject the Cartridge-shells.—Hold the revolver in the left hand. Bring the hammer to half-cock, and open the gate. Push out the shells with the ejector-rod, using the right hand, turning the cylinder with the thumb and forefinger of the left hand.

"To dismount the Revolver.—Half-cock the revolver; loosen the centre-pin catch-screw; draw out the centre pin; open the gate, and then take out the cylinder. To remove the ejector, turn out the ejector-tube screw, then push the front end away from the barrel and pull it toward the muzzle.

"The stock can be removed by turning out the two back-strap screws just behind the hammer, and that at the bottom of the strap. Remove the mainspring and guard. The parts of the cock can then be readily separated. The centre-pin bushing should be pushed out for cleaning. To remove the gate, turn out the gate-screw in the lower side of the frame, hidden by the guard. Withdraw the gate-spring and catch, then push out the gate.

"To assemble the Revolver.—Follow the directions for dismounting the revolver in inverse order. The mainspring is most conveniently mounted by turning in the screw part way, and then swinging the front end of the mainspring around it until it bears against the under side of the hammer-roll. The centre-pin bushing should be frequently removed for cleaning."

Russia.

The Russians have adopted an American revolver, Smith and Wesson's, 6 chambers and double action. Cal., 0.42 inch; length of barrel, 6.6 inches; weight, 2 lbs. 7 ozs. It carries a cartridge containing 23 grains of powder, 233.7 grains of lead. In the cavalry, all ranks except privates of transport are armed with it, and, like the American, but contrary to our own and other Continental armies, they are trained to depend to a considerable extent upon it. In the artillery all ranks except privates of transport are also armed with the revolver.

In the infantry, all Officers, sergeant-majors, drummers, buglers, non-commissioned officers of transport, and clerks are armed with it. Regular annual practice is carried out by both Officers and men at a target representing a man standing at 25 paces.

All senior classes at military educational establishments pass through an annual course.

To give some idea of the number of revolvers carried by Russian troops, it may be mentioned that 100,000 Smith and Wesson's have recently been supplied on a single contract, and this is not more than half the number that they possess.

Perhaps, in considering the introduction of the revolver into the Russian Army, more especially into the cavalry arm, it would be as well to mention two examples, taken from Colonel Dennison's book, showing the results of two engagements, in one of which the revolver was used, in the other the sword, as it is chiefly on this book that

the Russians have introduced revolvers, and from these examples we may gather the use they expect to make of them in the future.

"A fight took place in Virginia in November, 1864, between a squadron of Mosby's Confederate partisan cavalry, under Major Richards, and a squadron of Federal cavalry, under Captain Blazer. After a sharp hand-to-hand fight, in which the Confederates used the revolver solely, the Federal squadron was completely defeated; the casualties were, on the Southern side, only one man killed and several wounded, but so deadly was the effect of the revolver that Blazer's loss was 24 men killed, 12 wounded, and 62 prisoners. This was in killed and wounded 36 out of 100—more than one-third, while killed, wounded, and prisoners comprised virtually the whole force. The proportion of the killed to the wounded is an extraordinary proof of the deadly effect of the revolver.

"Compare this with the fight at Egmont-op-Zee, on the 2nd October, 1799, between the English dragoons and some French cavalry, where two troops dashed into 500 victorious French horse, and after a *mêlée* drove them off.

"Then the 500 French returned, and met at the charge the English, reinforced by one troop; a second fight then ensued, and yet in both conflicts, the sword being used on both sides, only three English troopers were killed, and nine wounded. In a fight of the same kind with revolvers, how different would have been the losses!"

Again, a troop sergeant-major of the 10th Hussars says:—

"On charging the Soudanese at El Teb, I first attempted to cut them down with my sword, but found I could do little execution with it; the enemy for the most part eluding my blows, and even, when struck, appearing to suffer little from them; I then drew my revolver, and soon knocked over three or four."

It has often been said that that Army which first learns how to take the best advantage of the most recent development in the improvement of modern man-killing weapons, possesses a marked advantage over a more old-fashioned adversary. In military matters changes of all sorts are constantly necessary for those who would keep pace with the rapid march of modern ideas and educated intelligence. Our progress may be said to depend on change.

To my mind it is a question for serious consideration whether our cavalry, good as it is, but armed as it is, would in a cavalry action be any match for an enemy armed with revolvers, as the Russians now are. Too great attention can hardly be paid at the present time to this point. The question of the best method of arming cavalry has been constantly discussed. The pistol, the sword, the lance, the rifle, have all in their turn had their adherents.

I am not an advocate of converting the cavalry man and his horse into a travelling armoury, but I believe that a light, handy, quick-firing, hard-hitting revolver is essentially a cavalry weapon.

If by the use of a comparatively clumsy revolver the Confederate irregular cavalry was able almost to annihilate the Federal horse twenty-two years ago, what may be expected from cavalry armed with

revolvers of to-day? The edge of the sword is no sharper than it was. The efficiency of the revolver is vastly increased.

It is often lost sight of that during the Franco-Prussian war only six Germans were killed with the sabre, though 100,000 cavalry were engaged for over six months.

France.

The revolver in use in the French Army is a double-action, non-extracting, six-chambered weapon, dating back to 1873. It weighs 2 lbs. 10 ozs., and takes a charge of 10 grains powder, 180 grains lead. The only difference between the weapon supplied to Officers and men is that the former is rather lighter and better finished. I have here the French regulation revolver which belonged to the late Prince Imperial, and which was given by him to Mr. Wilkinson just before the Zulu campaign. Officers, sergeant-majors, drum-majors, drummers, troopers in Cuirassier regiments, and drivers of train are armed and trained with a revolver. Both regular and reserve Officers go through an annual course of revolver shooting. They fire 36 rounds, 24 of which are single practice, 12 continuous, ranges varying from 13 to 30 yards, in addition to 36 rounds of blank. Non-commissioned officers fire 10 rounds of blank. Strict regulations with regard to safety at revolver practice are laid down, only one marksman at a time being allowed to advance within ten paces of the firing-point, and no revolver being allowed to be loaded until the firing-point is reached.

Germany.

The pattern revolver used in the Prussian Service is that introduced in 1879. Officers are supplied with a rather better finished weapon, which costs 3s. more, but is otherwise the same as the men's. It weighs about 3 lbs., the cartridge contains 22·2 grains of powder and 262·4 of lead.

There is a regular annual course of instruction and practice for both Officers and men, the ammunition being supplied by Government; the range from 25 to 100 metres.

All Officers, and in the cavalry non-commissioned officers and trumpeters, also all the troopers in cuirassier regiments, are armed with the revolver.

Italy.

The Officers, non-commissioned officers, and some of the trooper in the cavalry are armed with a Liège revolver.

Spain.

All Officers in the Spanish Army have to be in possession of a revolver. The pattern generally in use is a modified Smith-Wesson double-action revolver taking a cartridge which contains 20 grains of powder.

In the last Carlist rising revolvers were freely used.

Austria.

In Austria all Officers on active service have to provide themselves with the Austrian regulation revolver, which costs about 2*l*. Non-commissioned officers of cavalry, of artillery, of train, of Jägers, and about 70 men per squadron of Lancer regiments, are supplied by Government with revolvers in peace time. They are badly finished weapons, and many serious accidents have occurred owing to the hammer flying off at practice. Both the Officers' and non-commissioned officers' pistols are furnished with a double action.

The Austrians employ iron targets painted white and blue. The bull's eye to be aimed at is circular, but ovals are drawn as shown in Fig. 12 for purposes of scoring. The object of this appears to be to make the man fire low. Figure targets painted natural colours are also laid down in the regulations as to be used.

At aiming drill, to see that a correct alignment is taken, the instructor holds a small target up and places his eye at a pinhole in the centre of the bull.

At drill dummy cartridges are used for instruction in loading, &c.

During the annual course twenty rounds are fired. Besides this the ammunition remaining over, owing to casualties and non-effectives, is used for the worst shots.

England.

In the cavalry, warrant officers, staff sergeants, troop sergeant-majors, farriers, and trumpeters are armed with the revolver; in the infantry, warrant officers and staff sergeants. They fire 12 rounds per annum, 6 right-handed and 6 left. Owing to the small number of rounds allowed, the musketry authorities have been reluctantly compelled to abandon continuous ball practice. When we consider the complications introduced into the new Enfield revolver to obtain rapidity, it is curious that the course of annual practice should be framed to suit the old simple single-action weapon.

Until lately, the Colt's and Adams' pistols have been in use in our Service. These are now being superseded by the self-extracting Enfield.

In Continental armies the Officers are either bound to supply themselves with Government revolvers or they are supplied with them by the State. With us, on the contrary, not only is an Officer not expected to provide himself with the Government revolver, but it is impossible for him to purchase one.

Further, whereas the tendency on the Continent, more especially in the case of Russia, is to develop the use of the revolver, with us a contrary course appears to be pursued. Until lately, all our Lancer regiments were armed with the revolver, but now a carbine has been substituted.

Now, gentlemen, my hobby horse has run his course; he has had his little day; and he has made his mistakes (how numerous they are, no one knows better than his rider), and it is left with you for consideration—

1st. Should Officers be armed with a revolver ?

2nd. Should they be instructed in its use ?

Mr. C. FREDERICK LOWE (South London Rifle Club): Mr. Chairman and gentlemen, there are one or two matters as regards revolvers to which I wish to draw your attention. The first is the remarkable difference between the shape of the butt of the Colt revolver, in universal use in America, and that of the butts of all English-made revolvers. The point for consideration is, which is the best form of butt for the purpose of giving to the muscles of the hand the most powerful grip of the weapon in order to withstand the upward tendency of the barrel. Now, all English revolvers have a lump on them which comes between the thumb and finger. I have seen two excellent shots with the revolver, Mr. Webley and Mr. Winans, each of whom has been wounded by the recoil of the lump in question, whereas, in the Colt, if the revolver comes back, there is no lump to wound the firer's hand, and the extended base enables him to get the greatest muscular power of the three fingers of his hand against the ball of the thumb, so as to resist the upward tendency of the revolver. I submit, therefore, that the grip of the Colt revolver is superior to the grip of an English revolver. There is also a remarkable difference between all English rifles and American rifles as regards the bend of the butt and angle at which the heel plate is set, and I beg to draw the attention of practical makers to that point. It is true that Messrs. Colt supply for the English market a revolver fashioned according to English ideas, and there is a revolver on that table with a saw-handled butt, and also with the lump. What the advantage of the lump on the English revolver may be I cannot make out, but it would appear to have had its origin in the saw-handled butt of the duelling pistol, and I have heard very strong expressions of opinion on the part of practical revolver-makers as to its entire inutility. I quite agree with what Major Kitchener has said as regards the ivory fore sight of Silver's revolver. It is a remarkable fact that the Boers in South Africa had ivory fore sights on the rifles that shot down our troops at Majuba Hill. The great point is that they can be used either in bright or dull light. Of course an ivory fore sight would hardly be strong enough to stand the rough usage of a campaign, but I think Messrs. Silver have solved that problem by sinking the little ivory disc in a metal collar. With reference to the back sight, the great point about a revolver is to get a form of back sight which will give a rapid and at the same time an accurate aim without blur, and Mr. Webley has been kind enough to make a few revolvers in which he has carried out the American pattern, called the buckhorn sight, that is the lower half a pinhole—a pinhole opened out at the top. I hold in my hand a revolver so fitted, which I specially borrowed from Wimbledon, in order to illustrate this. That of course is a moot question. All our English sights ever since the days of Queen Anne, for rifles and revolvers, have been an angular notch, while the Americans make use of the buckhorn sight, both for sporting and military purposes. I venture to think it is possible to improve the back sight of the revolver in that way. As regards the trigger, I find the finger is apt to slip on a smooth trigger, especially if there is any grease. I think, therefore, that the trigger should be slightly roughed, to give the finger a better grip. With reference to the accuracy of revolver shooting, I have heard of an incident that took place in America. There is a class of gentlemen there called cowboys, who are armed generally with Colt's Frontier pistol. One of these cowboys, mounted on a horse, galloped along by the side of a train going at slow speed. He took one shot, and hit the insulator on a telegraph pole in front of him, and then turning round he took a second shot, and knocked off a second insulator behind him. That shows the degree of accuracy which can be attained by a man who knows how to use his weapon. I was told by an Officer who was in the Crimea, that there was a very good revolver then in vogue, called "Tranter's revolver," which had two triggers, similar to the Kynock's, one for revolving the cylinder, and the other for firing it. But the main point to which I would allude is the extraordinary manner in which the Government have done their business with reference to the cartridge. I believe it was found with the Enfield revolver that when the Mark II ammunition was used, which has 18 grains of powder and 265 grains of lead, the bullet being of the diameter of 0.455, that is five-thousandths more than the bore

of the revolver. If you had exploded three cartridges and wanted to extract them to fill up the chamber, all the cartridges came out. To obviate that they raised the diameter of the bullet from 0.455 to 0.476, so that the nose of the bullet would stick in the chamber, and only the exploded cases come out. The result of a defective extracting principle in the Enfield revolver, and of jamming a 0.476 bullet through a 0.450 barrel, has been to destroy the accuracy of every revolver used in Her Majesty's Service, and, as Major Kitchener has shown us, the friction is so great that the 0.476 bullet, Mark III, sometimes breaks into two pieces, and I think it is a great pity indeed that the accuracy of the weapons placed in the hands of our Officers and soldiers for service should be sacrificed in order to hide, as it were, the deficiencies of the Enfield revolver. Mr. Webley has certainly made some very great improvements in the manufacture of revolvers. I am told that the American Government will not purchase any extracting revolvers, because they consider that the problem has not yet been solved, but a leading American manufacturer admitted to me that if a satisfactory self-extracting revolver could be made, the day of the non-extracting revolver was settled. It seems to me, from my limited knowledge, that the problem has been solved, and I venture to think that the last improvement in the Webley and Wilkinson revolver as regards the locking apparatus is satisfactory and efficient. I also think Mr. Webley's anti-fouling collar is most satisfactory. I know there are many gallant Officers in the room who have expressed a strong opinion as to the inefficiency of the Government weapon, and I think I have shown the real reason from which those deficiencies arise. I must apologize for intruding upon you, but I have ventured to do so at the invitation of the gallant lecturer.

Major KITCHENER: With reference to Mr. Lowe's remark, that I found the Government ammunition break up, I think I ought to mention that the ammunition I was using was not actual Government ammunition, but ammunition that I obtained from Mr. Wilkinson. I have not had an opportunity of sufficiently testing the Government ammunition to say that that breaks up; in fact, the few rounds that I had to test did not break. I had about 40 rounds.

Mr. FREDERICK LOWE: I found them break up at Wimbledon.

The CHAIRMAN (Sir F. Middleton): Gentlemen, after the very interesting paper which we have just heard read, I am sure our thanks are due to Major Kitchener. I am only sorry that more of you have not canvassed his remarks, or brought anything to bear upon them, as I hoped would have been the case. I am afraid, as the lecturer said, that there is a want of interest in the British Army about the use of the revolver. It is very evident that in future warfare the revolver will be used a great deal more than it ever has been, especially by cavalry, and it has so far been recognized by the English Government, that whenever we do go on active service, though it is not absolutely recognized as an arm, still every Officer now provides himself with a revolver. And it certainly is of importance that as the fact of the necessity of a revolver is recognized for our Officers, the same weapon should also be furnished to artillery drivers and the drivers of transport. I believe that they have been so furnished in Egypt. It is evident that it is very necessary that a man on horseback, either with artillery or wagons, should have some means of defending himself besides the whip, and therefore we should adopt the revolver, and the practice of training men to fire a revolver should be just as much carried out as training men to fire a rifle. The fact is it is an excessively difficult thing to fire a revolver so as to hit, if you are not accustomed to it. As the lecturer says, it gives confidence to a man to know that he has in his possession a loaded revolver, but in nine cases out of ten, if he came to use it, he would not have so much confidence afterwards, for I doubt very much whether he could hit a haystack. I have seen it tried very often, and I really do not think some men could hit a haystack with a revolver. It is a practice that requires a very great deal of attention, and I hope soon to see that it is recognized as a very important part of our training. They already, I believe, at Wimbledon, have prizes for revolver shooting, and in my humble way out in Canada, I had some revolver shooting introduced, but still it has not met with the support which it ought to have done. The cavalry of the future, I think, will have to depend very much upon the revolver in preference to the carbine. I think that will be recognized after some time. With regard to one of the remarks of

the lecturer as to whether an Officer should be armed with a rifle or revolver, I think there can be very little doubt about that. A revolver is a weapon which, as he said, is a defensive, not an offensive weapon. An Officer armed with a rifle would be apt to be taking pot shots sometimes; his attention, instead of being given to his men, would be probably drawn away in firing at the enemy, and this I have seen done with very bad effect. An Officer nowadays has quite enough to do to look after his men without using the rifle. But when it comes to the question of a revolver, it is quite a different thing; he has that merely as a defensive weapon, and the more he is able to use it the greater confidence it will give him. As regards the remarks of Mr. Lowe, I have no doubt when once it is recognized that the revolver is to be an arm of the Service, we shall get what is proved to be the best weapon. I think you will all agree with me that our thanks are due to Major Kitchener for having brought this subject before us.

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OCCASIONAL PAPERS.

This portion of the Number is reserved for Articles, either Original or Compiled, on Professional Subjects connected with Foreign Naval and Military matters; also for Notices of Professional Books, either Foreign or English.

It is requested that communications or books for review may be addressed to Colonel Lonsdale Hale, at the Royal United Service Institution, Whitehall Yard, London, S.W.

COLONEL v. LÖBELL'S¹ ANNUAL REPORTS UPON THE CHANGES AND PROGRESS IN MILITARY MATTERS DURING 1885.

By Lieutenant-Colonel H. HILDYARD, Highland Light Infantry.

THE twelfth yearly issue of Colonel von Löbell's invaluable work has been published, and contains a complete review of military affairs on the Continent, and in many countries elsewhere, for the year 1885. The importance of the work increases as the successive annual publications take place, and it forms the only complete and accurate work which treats of the armed forces of the world. Each year the various changes that have occurred during the foregoing twelve months in the organization, armament, and training of the several military Powers are duly chronicled, while from time to time a concise account is given of the complete organization of each of them. To those military men, therefore, who are anxious to extend their study of organization and training beyond the scope afforded by the army to which they may belong, Colonel von Löbell's work cannot but be of the utmost assistance. The following compilation from its pages must be necessarily short and incomplete. It has been restricted to such portions as have appeared to offer most interest to British Officers; but it should be distinctly stated that it can offer no sufficient substitute for the work itself, to which those who have a knowledge of German—and they are now happily many—are referred.

The present issue is framed on the same lines as its predecessors. In the first part the several armies are dealt with in regard to their organization and the various laws and orders affecting the Officers, non-commissioned officers, and men. The Belgian Army has been selected as the one of which a complete account should be given, and a short description is also given of the armed forces of the minor military States of Annam, Morocco, Switzerland, Siam, and the United States of America. The second part is devoted to the tactics of the several arms, the question of small arms, artillery armaments, and military ballooning, which has latterly assumed an increased

¹ Jahresberichte über die Veränderungen und Fortschritte im Militärwesen. XII Jahrgang, 1885, herausgegeben von H. v. Löbell, Oberst z. Disp.—Berlin, Ernst Siegfried Mittler und Sohn. 1886. Pp. 663; 9·5" x 6·5" x 1"; weight, 2lb. 4 ozs. Price 8s. 6d.

importance. The third and last part is occupied with the military history of the year, comprising the Servo-Bulgarian War, the French expeditions to Madagascar and Tonquin, and our own operations up the Nile and in the Eastern Sûdan.

Germany.

There are few changes of any kind recorded in the German Army, and such as there are do not for the most part call for any particular remark. The question of the height of recruits has been so much debated with us, that it will not be without interest to reproduce the standards approved for the German Army in February, 1885.

	Maximum.	Minimum.
For all the Guard corps except railway troops .....	....	1'70 m.
Ditto by special authority in exceptional cases .....	....	1'67 "
Light cavalry of the Guard ....	....	1'65 "
Infantry .....	....	1'57 "
Rifles	1'75 m.	1'57 "
Cuirassiers and lancers	1'75 "	1'67 "
Dragoons and hussars.....	1'72 "	1'57 "
Horse artillery	1'75 "	1'62 "
Field " .....	....	1'62 "
Garrison " .....	....	1'67 "
Pioneers and railway troops ....	....	1'62 "
Train	1'75 "	1'57 "

Of the Guard at least one-half must be 1'75 m. and over.

Great attention has been paid of late years in the German Army to the improvement of the musketry instruction of the troops, and a new book has been issued. Regimental Commanders who had not previously gone through a course at the Musketry School at Spandau, had to attend one in October last, as well as two infantry Staff Officers from each army corps, four Officers of the General Staff, the Commandants of the non-commissioned officers' schools, and a regimental cavalry Commanding Officer from four of the army corps.

Revised instructions have been issued to regulate the expenditure of the sums available for field manœuvres and field firing, by which it is directed that the following subjects shall be given precedence according to their order:—

1. The field training of the infantry and rifles, as well as of the non-commissioned officers' schools stationed in garrisons, the situation of which does not offer facilities for such instruction in the immediate vicinity.

2. The field manœuvres of mixed detachments from the same or from neighbouring garrisons.

3. The tactical tours of infantry Officers. The scope of these is to be limited to the solution of simple tactical questions and conditions, and they must not therefore be framed on the model of the more extended General-Staff tours.

The money allotted to these objects is handed over yearly in a lump sum to each of the Generals commanding army corps, the Inspectors of Rifle Battalions and of the Infantry Schools, who subdivide the amount at their discretion; but it is distinctly understood that this subdivision should not be carried further than necessary. Where, for instance, the available funds will not suffice to allow of the training under all three heads being carried out, it would be devoted entirely to the first rather than extended proportionally to all three.

It has always been recognized by those responsible for the efficiency of the German Army, that a necessary condition to the success of the system of short colour service and a reserve is, that the latter shall be called out for training periodically, and very wisely the Government has not shrunk from carrying this out on account of the expenditure it entails. As a matter of fact, to any State having a military organization based on short service with the colours, the necessary expense will always be more than compensated for by the advantages to be gained by periodical training, for however short a time. It is not alone the efficiency of the Reserve men themselves that has to be considered, though this in itself is a very important point in these days of constant change in small arms, and in the conditions of attack and defence consequent upon it. But perhaps still more important is the moral effect of the presence of Reserve men in the ranks from time to time both on these and on the younger soldiers still serving with the colours. It might be supposed that in Germany, if anywhere, it could be dispensed with; for there are in addition the periodical musters of all Reserve men at the headquarters of their respective companies in the district in which they reside. But German Officers are of opinion that these are insufficient to maintain the military bond that should exist between those who have passed back into civil life and the formations to which they may at any moment be called back; and it is a matter of astonishment to them that a system should be accepted as satisfactory which allows of the military bond being virtually severed, as is the case in our Army, when the men pass to the Reserve on the completion of their colour service.

The number of men of the Landwehr and Army Reserve called out last year was as follows, including non-commissioned officers, hospital attendants, &c. :—

Infantry	93,200 men.
Jägers and rifles	2,700 "
Field artillery	6,624 "
Garrison "	5,700 "
Pioneers	2,500 "
Railway regiment.....	450 "
Train	5,346 "
<hr/>	
116,520	

The duration of the drills was limited, as in former years, to twelve days.

As regards the cavalry reserve, power was given to call up 26 men per army corps, to be borne as supernumeraries with the cavalry regiments for a period of six weeks; and it was left to the discretion of the Generals commanding corps to employ them with the train.

Similar arrangements were made for the exercise of a proportion of the reserves of the Bavarian Army, of whom 16,720 were called up, exclusive of 50 cavalry men, and also of 500 infantry and jägers, called up specially for the greater manœuvres only.

The periodical exercises of the Ersatz Reserves were conducted with the same regularity, those who came up for the first time being drilled for ten weeks, those in their second year for four weeks, and those in their third year for fourteen days.

During the past year these numbered—

1st drill	15,498 men of all arms.
2nd "	10,000 "
3rd "	8,500 "
<hr/>	
Total	33,998
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In Bavaria the total number was 5,200.

The whole, therefore of the Army and Ersatz Reserves belonging to the German and Bavarian Armies exercised during 1885 amounted to nearly 174,000 men.

Belgium.

There is no law by which the organization of the Army in time of war is fixed; but judging from the procedure on its mobilization in 1870, the following may be taken as its probable composition :—

i. An army of observation consisting of 2 army corps, each of 2 divisions and a reserve cavalry division.

ii. A movable division for the intrenched camp of Antwerp, composed of the infantry battalions still available, and the 4th battalions and 5th squadrons of regiments which are formed on mobilization.

iii. Some troops for garrison duty, including the regiments of siege artillery and most of the special companies of artillery and engineers, but these are very insufficient for the duties required.

The strength of the several forces is estimated to be as follows :—

Composition of the Army of Observation.

	Officers.	Men.	Horses.	Guns.	Wagons and carts.
Headquarters	20	36	91	..	4
2 army corps	1,768	58,530	13,854	204	1,324
1 reserve cavalry division	163	2,728	2,882	..	23
Ambulance for headquarters ...	..	6	15	..	4
Railway company	5	214	19	..	4
$\frac{1}{2}$ company engineer park	8	360	244	..	52
1 section field telegraph	2	62	20	..	4
1 police detachment	1	50	52	..	—
Total	1,967	61,986	17,177	204	1,415

5th Division. Movable Division for the Entrenched Camp at Antwerp.

In time of peace this organization does not exist, but on mobilization it is formed, on the same lines as the other divisions, to serve as a reserve to the army of observation. Its strength is fixed at 376 Officers, 13,269 of other ranks, 2,232 horses, 24 guns, and 191 wagons and carts. The infantry of the division is formed by the 1st battalions of the 3 Rifle regiments and the Grenadier regiment, and the 4th battalions of these, and of the first 4 regiments of the line, the whole being organized in 4 regiments, each of 3 battalions. The cavalry is composed of 1 regiment furnished by the 5th squadrons of each of the cavalry regiments. The artillery is provided by the 4 reserve field batteries of the 1st and 3rd Artillery regiments.

Garrison Troops.

After deducting the formations required for the army of observation and the movable division, only the following troops would remain available for garrison duties :—

Infantry.—12 line battalions, viz., the 4th battalions of the 5th to the 14th

regiments, the 2 first regiments of Rifles, and the 6th Carbinier battalions, in all 260 Officers, 10,764 men, 65 horses, 26 wagons.

Cavalry.—The 4 reserve squadrons of the 4 Lancer regiments and the School of Equitation, viz., 38 Officers, 677 men, 706 horses, and 5 wagons.

Artillery.—2 field batteries (the reserve batteries of the 2nd and 4th field artillery regiments), and 3 regiments of siege artillery; in all 53 batteries of a strength of 324 Officers, 9,907 men, 602 horses, and 12 field guns.

Engineers.—The Engineer regiment, except 5½ companies, and 3 special companies, numbering 55 Officers, 1,645 men, 12 horses.

The total strength of the garrison troops of all arms is consequently 677 Officers, 22,993 men, 1,398 horses, 12 guns, and 51 wagons.

The total strength of the Belgian Army on a war footing is as follows:—

Disposition.	Officers.	Men.	Horses.	Guns.	Wagons.
Army of observation	1,967	61,986	17,177	204	1,415
Movable division	376	13,269	2,232	24	191
Garrison troops	677	22,993	1,385	12	51
Total	3,020	98,248	20,794	240	1,657

It must be observed, however, that in case of mobilization a very large number of Officers would be required, for the provision of whom no satisfactory arrangements have been made, and also that the existing recruiting law cannot provide the number of men required to complete the army on a war footing. This law provides for eight classes of so-called militia of 13,300 men, besides a reserve of two classes, and such number of men as may wish to serve voluntarily. These classes as a fact do not reach the normal number, but supposing they should do so, we have—

8 classes of militia, at 13,300 = 106,400 men.

Deduct 30 per cent. waste = 31,920 "

There remain 74,480 "

Serving voluntarily 5,000 "

Reserve (9th and 10th classes
exclusive of married men) 11,000 "

Total 90,480 "

Bulgaria.

The year 1885 afforded the opportunity for testing the state of the army, which had been first called into existence only seven years previously. The result was more favourable than had been contemplated by those even who were well acquainted with the Bulgarian Army. It is not possible to estimate with any accuracy the number of men actually placed under arms during the operations which followed the mobilization; for after the junction with the Army of Eastern Roumelia, the forces of the two States were, so far as published accounts are concerned, reckoned together. The combined strength in the middle of November was given by Bulgarian reports as 110,000 men. About three-fifths of these, or 60,000 men, are said to have composed the Bulgarian contingent; but as a matter of fact this can hardly have been the case, for towards the end of November, Prince Alexander, after concentrating the whole of his available forces—both Bulgarian and East Roumelian—at Slivnitsa, could only dispose of 50,000 men.

The mobilization of the 1st levy answered the expectations formed in von Löbell's Report for 1884, some of the infantry regiments being raised even considerably over the regulated strength, but the want of trained Officers was seriously felt. As regards the 2nd levy, by an order of 1884, each infantry regiment was to form two reserve battalions, one of which was to be mobilized and expanded eventually into a regiment, the other being stationary as an Ersatz battalion. How far this order was carried out in its entirety does not appear, but in any case effect was given to it so far as to complete for each regiment the extra field battalion, and at least some complete regiments were formed and arrived at Widdin.

In the same way the available information as to the number of volunteers and the Landsturm formations is incomplete.

During the period immediately following the declaration of war, volunteers came in in considerable numbers. A corps was formed out of Macedonians, and a brigade about 4,000 strong, which operated to the north of the main army, was composed almost entirely of volunteers. The Landsturm or National Guard was called out, and formations of it came into action.

The equipment and armament of the army formed from the 1st levy were satisfactory, but for the further formations little was available. The weakest point was the train, which may be said to have been only called into existence at the outbreak of the war, and, owing to the scarcity of draught horses in the country, a portion of the 3,000 wagons which were requisitioned had to be drawn by the bullock-teams in ordinary use.

The mobilization and concentration were effected under most unfavourable and disheartening conditions, which must have tried the best troops, and the comparative celerity and regularity with which they were completed were most creditable to the spirit and endurance of the young army. In spite of bad weather and consequently heavy roads, the troops marched from Saremby to Sofia, a distance of 100 kilometres, over the Ichtiman Pass, in 48 hours, and one regiment—the Primorski—covered 95 kilometres in 32 hours, during which, of an effective strength of 4,500, only 62 men fell out.

In action they gave proof of equal spirit and discipline, and both on the offensive and defensive they showed themselves far superior to their Servian opponents.

China.

It is a notable sequel to the events which brought the hostilities in Tonquin to a close, that China, while gaining a striking advantage at Langson, has been able to recognize clearly that, in the present condition of her army, it cannot compete with a European force. The fact was sufficiently patent to others; but that the Chinese Government should acknowledge it could not have been expected, looking to the past history of the Empire, and still less so that steps should have been taken to remedy it. Such is, however, the case; for, yielding to the urgent representations of Li Hung-chang, it has been decided to remodel the entire army on the German system. For the moment such a decision is not likely to have any immediate effect upon the efficiency of the Chinese Army as against a European force. But when we come to consider the material of which a large portion of the army is formed, and the immense resources at the disposal of the Government, we may look forward to the future development of this new departure as likely to create in time a force which will have to be reckoned with seriously in any complication with the Celestial Empire.

For the present the experiment has been restricted to the force under Li Hung-chang's immediate command, amounting to about 10,000 men. These troops have actually been formed after the German model, and have been located in standing camps between Tientsin and the Gulf of Petchili. The infantry is formed in regiments of 14 companies armed with the Austrian

rifle; they are drilled in accordance with the German regulations and instructed in field duties. Great weight is given to musketry instruction, and the men have to shoot through the German third class each year, but the results attained are not yet known.

The artillery is composed of 6 field and 3 mountain batteries each of 4 guns, the former being of Krupp's rifled breech-loading 7.85 cm., the latter 7.5 cm. The field batteries are horsed by 6 Mongolian ponies equipped like the German artillery horses; the mountain guns are carried by 4 horses of stouter build, equipped after their own way. The German words of command have been adopted, and have led to some difficulty from the impossibility of rendering them in the Chinese tongue without considerable circumlocution. Notwithstanding this a fair measure of efficiency has been attained.

But here the reorganization as at present effected comes to a standstill. The cavalry remains as it was, except that it is now armed with the Mauser, Spencer, and Winchester rifles. An Engineer corps and train have still to be formed, as contemplated by the new scheme.

The lesson learnt from the brief hostilities with France have not been restricted to the army. The affairs of Sheipoo and the Min ports led sufficiently clearly to the conclusion that neither the navy nor the coast defences were in such a condition as to stand against a European fleet. It has, therefore, been determined to reorganize the former and centralize the administration under a Board of Admiralty, while the forts are to be completely remodelled.

France.

From the recruiting statistics it appears that the total number of men liable for service during 1884 was 313,951, of whom 7,784 were absentees from various causes. The following were excused from immediate service:—

Under Art. 17 of the law regulating	
recruiting	50,643
Physically unfit	37,842
Conditionally excused or already serving	
as volunteers	31,525
Put back during 1882-83	39,105
Only fitted for the administrative services	16,090

The yearly contingent for the army was apportioned as follows:—

	1st Portion.	2nd Portion.	Total.
Of the 1884 class	94,422	34,057	128,479
Put back from 1883 class	7,683	3,253	10,936
" 1882 "	3,716	802	4,518
	<hr/> 105,821	<hr/> 38,112	<hr/> 143,933

After deducting 9,231 non-effectives spread over all arms, the contingent was allotted in the following manner:—

	1st Portion.	2nd Portion.	Total.
<i>I. Infantry—</i>			
Line regiments	59,534	26,526	86,060
Rifle battalions	4,891	681	5,572
Zouave regiments	1,570	....	1,570
Algerian tirailleurs	100	100
African light infantry	3	3
Foreign regiments	4	4
	<hr/> 66,102	<hr/> 27,207	<hr/> 93,309

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II. Cavalry (only 1st portion)—

Cuirassiers.....	2,202
Dragoons	4,734
Rifles	3,554
Hussars	2,089
Chasseurs d'Afrique.....	590
Cavalry school	11
	<hr/>
	13,180

	1st Portion.	2nd Portion.	Total.
III. Artillery—			
Artillery regiments	10,255	5,681	15,936
Pontoon	751	....	751
Garrison artillery battalions	2,307	2,907	5,214
Artificers and laboratory companies	128	....	128
	<hr/>	<hr/>	<hr/>
	13,441	8,588	22,029

IV. Engineers—

Engineer regiments	1,932	680	2,612
20th Engineer Battalion	80	80
Railway companies.....	92	92
	<hr/>	<hr/>	<hr/>
	2,104	680	2,784

V. Train	1,900	500	2,400
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Of the above, those belonging to the 1st portion joined on the 1st and 5th December, 1885, those of the 2nd portion on the 27th November.

Italy.

The increase contemplated by the law of the 29th June, 1882, has been carried into effect, and a permanent addition to the army of the following formations, by which the number of army corps has been increased from 10 to 12:—

- 16 infantry regiments.
- 2 bersaglieri ..
- 2 cavalry ..
- 2 field artillery regiments.
- 8 mountain batteries.
- 4 horse artillery batteries.
- 1 engineer regiment.
- 12 commissariat companies.

The total number of infantry regiments is now 96.

By an order of the 22nd March, 1885, the Alpine companies have been permanently allotted to six frontier districts, viz. :—

Mondovi.....	1st to 11th companies, except 7th company.
Bra	12th to 23rd companies.
Savigliano	28th to 36th ..
Turin	the 7th, the 24th to 27th companies, and 38th to 43rd companies.
Milan	44th to 55th ..
Conegliano....	56th to 72nd ..

In accordance with the recommendation of a Committee of General Officers, the period of active service for the cavalry soldier has been reduced from four years to three, the period in force for the other arms. The present organization of the militia services is as follows :—

I. *Mobile Militia*—

(The Peninsula)

Infantry.....	41 regiments of three battalions of 4 companies.
Bersaglieri	20 battalions of 4 companies.
Alpine companies	36, each equal to 2 line companies.
Field artillery	12 brigades of three batteries of 8 guns.
Garrison „	24 companies.
Engineers	14 companies sappers.
„	2 railway companies.
„	2 telegraph „
„	2 pontoon „
„	4 train „

Sanitary and commissariat services, each 12 companies—

(Sardinia)

Infantry	3 regiments of three battalions of 4 companies.
Bersaglieri.....	1 battalion of 4 companies.
Cavalry	1 squadron.
Artillery	1 brigade of 2 field and 2 garrison companies.
Engineers	1 sapper company.
Sanitary and commissariat	each 1 company.

The weak point of these formations lies in the insufficiency of the cadres. In time of war 12 divisions of about equal strength with those of the first line would be formed from them.

II. *Territorial Militia*—

Infantry	320 battalions of 4 companies.
Garrison artillery....	100 companies.
Engineers	30
Alpine companies ..	72 in 30 battalions.
Sanitary and commissariat	13 companies each and one for Sardinia.

The same defect detracts from the efficiency of these formations as in the case of the mobile militia, viz., the incomplete and insufficiently trained cadres. A large number of the subaltern Officers have never served in the army, as is also the case with the men, and must be so under the present conditions of service, unless the strength of the standing army be still further increased. The following comparative table shows the increase both in the number of men serving, and of those on furlough liable to recall since 1883, as well as the total armed force available on mobilization :—

1006 ANNUAL REPORTS UPON THE CHANGES AND PROGRESS

Distribution.	30th September, 1883.			30th June, 1885.		
	With the colours.	On furlough.	Total.	With the colours.	On furlough.	Total.
Standing army —						
1st Category	170,500	324,372	494,872	226,013	338,022	564,035
2nd " .....	..	240,040	240,040	..	289,985	289,985
Officers	12,914	..	12,914	13,510	..	13,510
Ersatz Officers .....	..	2,939	2,939	..	3,418	3,418
Total	183,414	567,351	750,765	239,523	631,425	870,958
Mobile Militia —						
1st Category	174,887	..	174,887	..	151,894	151,894
2nd "	164,347	..	164,347	..	163,592	163,592
Officers	1,106	..	1,106	..	937	937
Ersatz Officers .....	..	910	910	..	1,401	1,401
Total .....	..	341,250	341,250	..	317,824	317,824
Territorial Militia —						
Men .....	..	1,017,212	1,017,212	..	1,207,864	1,207,864
Officers .....	..	4,742	4,742	..	5,442	5,442
Total .....	..	1,021,954	1,021,954	..	1,213,306	1,213,306
Officers of Auxiliary Services .....	..	1,533	1,533	..	1,902	1,902
Reserve Officers unattached .....	..	3,748	3,748	..	3,354	3,354
Total .....	..	5,281	5,281	..	5,256	5,256
General total	183,414	1,935,836	2,119,250	239,523	2,167,811	2,407,344

Morocco.

The Report upon the forces at the disposal of the Sultan of Morocco is not without interest, from the fact that this State is the only one in North Africa that has been able to retain its independence, and that the day may probably arrive before long when it will have to take up arms to defend its integrity. The permanent force is composed of four formations, the Bokhari or Black Mounted Guard, the Mchazniyyeh or local forces, the Askari infantry organized on the European model, and the Tobdschiyyah, or artillery. Of these, the Bokhari, Askari, and artillery are regularly maintained, armed and drilled, and form by comparison an efficient force; but they are few in number and are not to be compared, except as regards endurance, with European troops. The Mchazniyyeh are mounted contingents at the disposal of the Governor of each district, for the maintenance of order, and are not regularly trained as soldiers. Armed with the long flint musket they are not a formidable foe except against natives equally badly equipped; but they are capable of being turned into a useful light cavalry for scouting and raiding purposes. The bulk of the available forces are the Harkah, which includes the whole of the remaining efficient male population; but the great bulk of these cannot really be regarded as available for warlike operations, and would be an incumbrance to the fighting force, which might probably number about 80,000 to 100,000 men.

The numbers estimated in the Report are as follows :—

Bokhari	5,000 cavalry.
Mchazniyyeh	25,000 „
Askari	6,300 infantry.
Artillery	840 „
Harkah	300,000 „
Total	337,140

Austria-Hungary.

During the past year the reorganization of the Austrian Army on the territorial system, which was inaugurated in 1882, was completed by the necessary changes in the organization of the field artillery. As yet, however, it has not been possible to carry out in their integrity the arrangements for the future quartering of the troops, on account of the want of accommodation in some of the new military districts. This defect is in course of being remedied by the building of barracks, stores, magazines, riding schools, &c.; but at the beginning of 1886, in certain districts no progress had been made beyond the plans and proposals for construction. Notwithstanding this, it must be regarded as an important step towards the increased efficiency of the army that in the majority of the districts the troops are already distributed as designed by the territorial organization, which must ensure a material decrease in the time required for mobilization.

Of the whole 102 infantry regiments at least one battalion and the Ersatz-cadre are quartered at the territorial headquarters. All 4 battalions of 50 regiments are stationed there, or in the immediate vicinity; 33 regiments are quartered with 3 battalions away from the territorial station, but within the army corps district. Of the foregoing 83 regiments, 28 battalions are detached with the army of occupation in Bosnia-Herzegovina. The remaining 19 regiments have three battalions stationed elsewhere than in the army corps district. The Tyrol Jäger regiment has 9 battalions and the Ersatz battalion cadre in its own district, and the tenth battalion in Herzegovina. Of the 32 Jäger battalions, 10 are in their proper districts,

16 elsewhere, besides 6 with the army of occupation. The cavalry have 28 regiments in their own districts and 13 outside them. Only one of the 14 artillery brigades is not in its proper district. The engineers, pioneers, sanitary troops, and train are all at the stations allotted to them.

The recruiting statistics show that of 858,041 liable in the various classes in 1884, only 120,047 were found fit, of which number 95,822 were taken for the army. The disposal of those liable was as follows:—

Temporarily dispensed with	46,409
Absentees	41,098
Dismissed or postponed for physical disability	649,706
Found fit	120,047
Not decided upon before date of calling up	781

Some interesting statistics are given in regard to the height of those called up. The total number dismissed on account of not attaining to the minimum height (1·554 m.) was 92,979. The proportion of these according to nationality was as follows:—

Croats	206 per 1,000
Moravians, Czechs, and Slovaks	243 "
Germans	251 "
Roumanians ..	300 "
Ruthenians	401 "
Magyars	436 "
Poles	476 "

Taking the whole number found unfit for service, the Magyars had proportionally the greater number, and the majority of them were in height above the required standard, whereas the opposite was the case with the other nationalities.

The following table shows the average age of the Officers of the senior ranks of the several arms actually serving at the beginning of 1885:—

Branch of the Service.	Colonel.	Lieut.-Col.	Major.
General staff	45·7	42·3	39·2
Infantry and Jägers	51·8	51·1	47·9
Cavalry	47·7	46·4	45
Artillery	51·7	51·6	47·4
Engineers	52·9	49·1	46·4
Pioneers	52	52	48·1
Sanitary service	55	55	54
Train	56·5	55·7	52·7

The organization of the field and garrison artillery has, as already stated, been adapted during the past year to meet the territorial scheme for the Army.

The field artillery now consists of 14 corps artillery regiments and 28 independent heavy battery divisions. In each army corps the corps artillery regiment and two independent heavy battery divisions form an artillery brigade. These artillery brigades follow the numbering of the army corps to which they belong, so also do the artillery regiments. The independent heavy battery divisions belonging to the 1st Artillery Brigade are numbered

1 and 2 ; those of the 2nd, 3 and 4, and so on. In time of peace each of the 14 corps artillery regiments is divided into the regimental staff ; the 1st heavy battery division composed of 3 heavy batteries numbered from 1 to 3 ; the 2nd heavy battery division, of 2 light batteries with the numbers 4 and 5 ; the ammunition park cadre and the Ersatz dépôt cadre.

In immediate connection with the respective corps artillery regiments are, further, with the 1st, 2nd, 4th, 5th, 6th, 7th, 10th, and 11th a horse artillery battery division composed of the divisional staff and 2 horse artillery batteries numbered 1 and 2 ; with the 3rd, 4th, 5th, 7th, 8th, 9th, 12th, 13th, and 14th a heavy battery division, on a lower peace establishment, numbered from 29 to 37, each consisting of the divisional staff, 3 heavy batteries numbered from 1 to 3, and the ammunition park cadre ; with the 1 to 3 and the 6 to 14 a mountain battery.

On mobilization are formed from each ammunition park cadre a corps ammunition park and also 2 columns for the army ammunition park ; from the Ersatz dépôt cadre, the Ersatz dépôt for the regiment and from the ammunition park cadres of the heavy battery divisions 29 to 37, divisional ammunition parks numbered the same. Each of the 28 independent heavy battery divisions is composed of the divisional staff, 3 heavy batteries numbered from 1 to 3, the ammunition park cadre, and the Ersatz dépôt cadre.

With an army in the field the corps artillery regiments with the 1st and 2nd battery divisions and the corps ammunition park form the corps artillery ; the independent heavy battery divisions 1 to 28, the heavy battery divisions 29 to 37, detached from the corps artillery regiments with the ammunition parks belonging to them, and horse artillery divisions form the divisional artillery of the infantry or cavalry divisions respectively. The army ammunition park is formed from the 1st and 2nd ammunition columns of the corps artillery regiments.

The garrison artillery is composed of 12 garrison artillery battalions, each consisting of the staff and 6 companies, of which the 6th has in peace-time only a cadre. To the 9th battalion belong 3 mountain batteries, which are doubled on mobilization. The heavy batteries have 9-cm. guns, the light and horse batteries 8-cm., and the mountain batteries 7-cm.

In time of peace each artillery brigade is stationed in the territorial district of the corps to which it belongs, with the exception of the 14th, which is in the 2nd army corps district. The corps artillery regiments are at the station of the corps headquarters, the independent heavy battery divisions at that of the infantry division to which they are allotted by the *ordre de bataille* of the field army. The garrison artillery battalions are distributed among the several garrisons. The ammunition park and Ersatz dépôt cadres are at the headquarters of the corps artillery regiments, and the 6th garrison company cadre at that of its battalion.

The entire corps artillery regiment is commanded by a Colonel ; the independent heavy battery divisions and the garrison battalions by a Lieutenant-Colonel or a Major. The heavy battery divisions belonging to the corps artillery regiments are under the command of a Lieutenant-Colonel, Major, or Captain.

The whole of the necessary equipment, armament, and field stores required on mobilization for every portion of the corps artillery regiments are kept complete at the headquarters of regiments, and those for the independent divisions and the garrison battalions at their headquarters. The necessary increase in horses is provided for by requisition under the existing law.

The Austrian Landwehr was during 1885 brought into accord with the territorial system, and placed under the direct command of the army corps district commanders. The separate battalions have been amalgamated into regiments, to be formed on mobilization under the command of Officers

previously designated; the stations of the battalions made coincident with those of the line battalions, and arrangements made for the formation of Landwehr brigades and divisions, measures which are calculated to facilitate the formation of efficient fighting bodies, and place the Austrian Landwehr on an equal footing with the Hungarian in this respect.

An important duty of the corps commanders in relation to the Landwehr is the completion of the corps of Officers not included in the cadres, which is provided for by means of at least one aspirant school in each army corps district. A General or a Colonel is attached to each corps commander to assist him in the administration of the Landwehr.

The Landwehr infantry consists of 82 battalions, for which cadres exist in peace-time, from which on mobilization a battalion of 4 companies, 1 Ersatz, and eventually 1 reserve company are formed. These battalions would as a rule be combined in regiments of 3 or 4 battalions, the formation and command of which are fixed beforehand. A separate organization is retained for the 10 rifle battalions of the Tyrol-Vorarlberg. Landwehr divisions to be included in the *ordre de bataille* of the field army are also provided for, consisting of 2 brigades, 14 to 15 Landwehr battalions, 3 to 4 squadrons from the Regular Army or the Landwehr, 3 batteries from the Army, and also technical and administrative troops.

The Landwehr cavalry consisting of 6 regiments, 3 of which are dragoons and 3 lancers.

A new scheme has been published for the war formation of the Hungarian Landwehr, by which a half brigade composed of 4 battalions will number 84 Officers and 3,832 men, of whom 74 Officers and 3,592 men combatants.

The strength of an independent Honved battalion is 22 Officers, 960 men, of whom 18 Officers and 898 men combatants.

The war strength of a Landwehr Hussar regiment is 30 Officers, 743 men, and 752 horses, of whom 25 Officers and 609 men combatants, with an Ersatz squadron of 8 Officers, 170 men, and 161 horses.

Towards the end of February, 1886, a new Landsturm law was laid before the Parliaments in Vienna and Buda-Pesth, based generally on that in force in Germany. It differs in this respect, that in the Austrian law the first levy of the Landsturm, viz., those not belonging to the Army or the Landwehr, whether they have already served or not, between 19 and 37 years of age, are liable to be allotted to the Ersatz Reserve for the Army or Landwehr if required. The second levy, viz., those capable of bearing arms between 37 and 42 years of age, and retired Officers up to 60, would then form, strictly speaking, the Landsturm, and provide for local defence. This measure is considered necessary on account of the insufficient strength of the Austro-Hungarian Army as at present constituted. This amounts to 1,150,000 men of the Regular Army and Landwehr on a war strength, exclusive of an Ersatz Reserve of 80,000 men for the Army and 130,000 for the Landwehr. The experience gained by the operations in Bosnia-Herzegovina have shown that, in case of war in a country in which bad roads and difficult ground require extraordinary exertions on the part of the troops, this number would be insufficient to meet the waste to be expected.

East Roumelia.

The precise strength of the force contributed by East Roumelia to the combined Bulgarian Army in September, 1885, cannot be ascertained. Immediately after the *coup d'état* by which the junction was effected the infantry consisted of 20 companies, including 2 instructional companies, numbering 3,000, exclusive of Officers. A squadron of cavalry, a half battery of artillery, and a company of sappers raised the total force to about 3,500 of all ranks.

On mobilization, following the scheme in force, each of the twelve military districts should have furnished a battalion of the first levy for the Militia and a battalion of the second levy, besides an Ersatz company for the former battalion. No establishment was fixed for the third levy, or reserve to the Militia, which would be formed into provisional battalions and companies. The numbers required to complete the 12 battalions of each levy were 264 combatant Officers, 1,248 non-commissioned officers, and 10,380 men. Of the 12 yearly classes of the Militia liable by law the 5 youngest, numbering about 20,000, had been trained in the cadres of the Militia. Allowing for the waste the number obtainable was sufficient to complete all the battalions of the first levy and partially those of the second levy.

The same difficulty was, however, experienced in East Roumelia as in Bulgaria in the matter of Officers and non-commissioned officers, on account of the withdrawal of the Russians who had been serving in the Army. This reduced the number of available Officers to 107; and to remedy this in some degree 40 were taken from the battalions of the first levy. But this, while helping the regular battalions, still further reduced the already insufficient number available for the Militia, for which only 147 were forthcoming out of the 528 required.

The deficiency was still further increased by the requirements of the Ersatz troops. The only possible way of filling these deficiencies was by employing former Officers, mostly Turks, and by appointing non-commissioned officers, who could be very ill spared, and who, further, had not the education to fit them for the position of Officers.

The result was that the 24 battalions of the first and second levy, though complete in men, had an insufficiently formed staff of non-commissioned officers, and only 10 Officers per battalion, being 2 per company. Very few battalions were formed from the third levy, but on the other hand a number were raised by means of volunteers, who came forward in great numbers.

At the end of October, 1885, the strength of the infantry was estimated at from 34,000 to 36,000 men, who were distributed between the 24 battalions of the first and second levy, and 8 to 10 battalions formed of men of the third levy and volunteers. The cavalry received only an augmentation of 1 or 2 weak squadrons, which with the squadrons previously existing subsequently formed the nucleus of the 3rd Bulgarian Cavalry Regiment. There was no provision for the train in peace-time, and it had to be formed by means of the requisition of country carts under the same difficulties as in Bulgaria. The total strength of the force, including the Ersatz cadres retained in the several garrisons, amounted to about 40,000 men.

At least a half of this force took part in the war with Servia, fighting side by side with the Bulgarians, and acquitting themselves in the same honourable manner.

Immediately after the armistice in December, 1885, the reorganization of the East Roumelian Militia was taken in hand on the same lines as the Bulgarian Army.

According to this they would be organized in infantry regiments of 4 battalions, and form the 5th and 6th brigades of the United Bulgarian Army. The small contingents of the other arms were equally incorporated in it.

Persia.

The events on the borders of Afghanistan have led others besides ourselves and Russia to take a special interest in the Persian military resources, an account of which is given in v. Löbell's publication. Nominally the Persian Army is composed of 70,000 men of all arms; but as it is maintained or not more or less according to the exigencies of the moment, and is not pro-

vided for by any fixed budget, much dependence cannot be placed upon the estimated numbers.

The force is divided into three local armies in time of peace allotted to the Provinces of Teheran, Ispahan, and Tabriz respectively. The Governors of these provinces are the Commanders-in-Chief of the several armies which are dependent upon them for their organization, armament, and training, the result of which arrangement is that there is no unity whatever in any of these directions.

The total number of infantry battalions is 76, formed into 8 to 10 companies, and they have an effective strength varying from 250 to 1,000 men. The cavalry consists of 2 regiments of 4 squadrons, and one of two squadrons, a squadron forming a body guard to the Shah, each squadron numbering from 50 to 150 horses.

The artillery is composed as follows :—

- 3 field batteries, each of 6 guns.
- 20 battalions of foot artillery, each of 200 men, for the service of 2 batteries of 6 guns.
- 30 mountain guns.
- 200 camel guns, with 400 camels.

One battalion of engineers exists, but the term is purely honorary, for the men composing it have no claim whatever to any technical knowledge.

The Ispahan Army, commanded by the Prince Zile-e-Sultan, is the best organized and trained owing to the energy and intelligence of its commander. It is composed of 4 regiments of infantry, 2 of cavalry, 3 batteries of field and $1\frac{1}{2}$ of mountain artillery. It is recruited partly by means of volunteers, partly by contingents drawn from the several villages of the province. The infantry are formed in companies of 200 men in two ranks, clothed in grey with helmets, and armed with the Werndl rifle and yataghan. The drill is based on the Austrian Drill-book, but the musketry instruction is very insufficient, and there is no training in field work.

The 2 cavalry regiments are composed of 2 squadrons of 150 horses in 4 subdivisions. The men are clothed as the infantry, but with a white felt cap, and armed with the Russian Cossack sword and the Werndl carbine. The horse equipment is Persian and for the most part in bad order. The men are naturally good riders individually, but their instruction as cavalry is only nominal.

The artillery have the Uchatius gun of 7 and 8 cm., the men being armed with sword and Snider carbine, and clothed as the cavalry, from which they are only distinguishable through wearing a dark-coloured cap. Their training is excellent, and 30 rounds per gun are allowed annually for practice.

The weakest point in the army is to be found in the native Officers, who, with the exception of one or two trained abroad, are totally un instructed in military matters. The natural result is that the discipline is very bad.

The two armies of Teheran and Tabriz can lay no claim to such an organization as that of Ispahan. No attempt is made to obtain any similarity in uniform, training, or armament, and their discipline is still worse. As an instance of the value of these troops an expedition is quoted which was sent to the Atrek in January, 1885, against the Yomuds. The expeditionary force, composed of 2,000 men of whom 1,600 were infantry, was drawn from the Teheran Army. Arms were issued to the infantry only when they were ready to march; they consisted of 1,200 percussion arms of the oldest construction, and 400 Werndl rifles. Before the force was clear of the environs of Teheran, where it had been reviewed by the Shah, it had dwindled to 1,200 men, and when it reached the Atrek, only 600 remained, the rest having been dismissed by their commanders, though money was drawn for

the original strength of the force for the duration of the expedition. A beginning has been made with the formation of a fleet, and lately 10 Uchatius guns and 4,500 Werndl rifles have been sent to Teheran from Austria.

Roumania.

While keeping aloof from the complications in the Balkan peninsula, the young kingdom has been steadily carrying out the reorganization of its army as contemplated by the law of June, 1882. The infantry is divided into 32 Dorobanzen regiments, varying in strength from nearly 1,500 men to about 300, the larger effective being allotted to frontier regiments, which have to find numerous posts and picquets for the mountain passes and landing stations on the Danube. The permanent cadres are on an average about 180 men; the rest are on furlough, but are called up for a week's duty in every month. The regiments are formed into 4 army corps each of 4 brigades of 2 regiments.

The cavalry consists of 12 Kalaraschen regiments of an effective of about 450 men, and a permanent cadre of 137 men and 74 horses; the arrangement regarding duty being similar to that in the infantry. They are formed into 4 cavalry brigades of 3 regiments.

The artillery is composed of 8 field artillery regiments of 4 batteries and 18 territorial batteries, of which 4 are mountain batteries. The whole have, under the new organization, been formed into 4 artillery brigades.

According to a scheme by General Brialmont, for the defence of Bucharest, which was accepted by the Roumanian Government, the city is to be protected by an *enceinte* of 25 kilometres circumference, and 13 detached posts of three different sizes situated at from 6 to 9 kilometres from the *enceinte*, the enlarged circumference of defence being 60 kilometres. These detached forts are in each case to carry one, and in some two plated circulating turrets, of which 54 in all are required for the defensive works. Four of the forts are in course of construction, viz., those at Chitilla, Magoschoia, Otopeni, and Tumari: The estimated time for the completion of the system is during the year 1890.

The railway system was further developed in 1885 by the opening of the line Piatra-Bacau, 57.8 kilometres in length. A line from Bucharest to Czernavoda was commenced, which will join that from the latter place to Kustendje, and open direct communication between the capital and the Black Sea. Other subsidiary lines were also undertaken.

Russia.

The new organization of the train services in the Russian Army was dealt with generally in the Report for 1884, and has been followed in that for 1885 by a more detailed description of the train which accompanies a Division of infantry and its position on the march.

i. The 1st echelon of the train, answering generally to the German "small baggage," is with the columns of the fighting troops.

Infantry Train.—The regimental train, 1st echelon, follows the 4th battalion of each regiment, and consists of 8 small-arm ammunition carts, 1 sanitary wagon, 4 four-horsed ambulances, 6 Officers' carts, and 4 reserve horses. These 23 vehicles and 40 horses, the carts ranged by twos, occupy a space of 150 paces.

Artillery Train.—Assuming that the artillery brigade belonging to the Division is disposed with the 1st heavy battery behind the 1st battalion of the 1st regiment, the 2nd behind the 1st battalion of the 2nd regiment, and the 4 light batteries between the 3rd and 4th infantry regiments, the train would be divided as follows:—

Each of the heavy batteries is followed by 16 ammunition wagons, 1 store wagon, 1 reserve limber, 1 ambulance; each light battery by 12 ammunition wagons, 1 store wagon, and 1 reserve limber. The 1st echelon of the artillery brigade train follows the 4th light battery, and consists of 1 ambulance, 2 medical store carts, 1 sanitary cart, 2 Officers' and 1 Brigade Commander's carts. The 4 light batteries with the train occupy on the line of march 2,150 paces, each heavy battery 600 paces.

The length of the Division with train, viz., 4 infantry regiments and 6 batteries, without allowing for an advanced guard, is 10,850 paces.

Cavalry Train.—The organization of an ordinary infantry Division does not include any cavalry. The 1st echelon of the train for a dragoon regiment follows the 6th squadron, and consists of 6 small-arm ammunition carts, 1 medical store and 1 sanitary cart, 2 ambulances, 6 two-horsed squadron wagons, 40 remounts, 20 mounted men in charge of horses. The squadrons each occupy 180 paces with intervals of 50 paces; the train 192 paces.

ii. The 2nd echelon of the train, answering to the "heavy baggage" of the German Army, follows the fighting troops at an interval of from 500 paces to 8 kilometres.

Divisional sanitary detachment, 40 wagons occupying 300 paces.

" hospital, 10 wagons occupying 275 paces.

" Staff, and of the Commander of the 1st brigade, 5 two-horsed wagons occupying 50 paces.

2nd echelon of the 1st regiment occupying 600 paces, and consisting of 16 two-horsed company wagons of the 1st and 2nd battalions; 16 of the 3rd and 4th battalions, 6 regimental wagons and 10 reserve horses, in all 63 vehicles and 111 horses.

2nd echelon of the 1st heavy batteries, 90 paces; 4 batteries and 3 Officers' wagons.

" 2nd regiment, 600 paces.

" 2nd heavy battery, 90 paces.

" 3rd regiment, including transport for the Commander of the 2nd brigade, 615 paces.

" artillery brigade and the 4 light batteries, 400 paces, viz., 2 carts, 3 two-horsed wagons, and 28 battery wagons.

" 4th regiment, 600 paces.

The length of the 2nd echelon of the train, viz., 466 vehicles and 887 horses, including intervals, amounts, therefore, to 3,845 paces, and that of the whole Division with the 1st and 2nd echelons of the train, with the prescribed intervals, to 15,195 paces.

The 2nd echelon of the train of a dragoon regiment follows the 1st at an interval of from 500 paces to 8 kilometres, and consists of 6 two-horsed squadron wagons, 17 two-horsed regimental train wagons, 1 veterinary cart, 1 Staff and 1 Commanding Officer's cart, and 8 reserve horses, occupying 306 paces.

iii. The Divisional train, at a distance of 1 day's march.

Sanitary column, a Divisional hospital, 275 paces.

General column consisting of 44 vehicles and 244 horses, comprising the transport of the Divisional train staff, of regiments with the reserve of clothing, trenching tools, &c., and the reserve of horses, at the rate of 10 per regiment and battery, 700 paces.

Provision column divided into two parts. 1st. The expense transport, composed of 150 wagons and 500 horses, and carrying 4 days' supply for the whole Division,¹ 1,900 paces.

¹ The regimental train carries 1½ days' supply for infantry and artillery, 2½ days' for cavalry and horse artillery, and 5½ for engineers.

2nd Reserve transport consisting of 165 vehicles with 556 horses, carrying provisions for the completion of the expense transport from the nearest magazines, and serving as a transport reserve to the Division for the removal of the sick and wounded. If the Division is able to subsist on supplies furnished by the country, the reserve transport is relegated to the general army train.

Artillery column. When an artillery park, for example a flying park brigade, of 2 infantry and 2 artillery ammunition columns, is attached to the Division.

Engineer column. A portion of an engineer park, which contains intrenching tools and other technical implements for a sapper company and an infantry Division.

Exclusive of the two latter columns and the Divisional hospital, the following are the total numbers of carriages and horses with the Divisional and brigade trains respectively of the units specified :—

An infantry Division	359	carriages,	1,306	horses.
A cavalry "	73	"	240	"
A brigade of rifles.....	107	"	257	"

The regimental and Divisional train are organized in such a manner that troops detached from the Division can at once be supplied with the necessary proportion of the train. For example, in the event of the 3rd regiment being detached from the Division, it would be given from the Divisional train; the 3rd section of the general column, of the expense transport, and eventually also the 3rd section of the reserve transport. This can be done without difficulty, for each of the above-named columns is organized in 6 sections, the first 4 for the several infantry regiments, the 5th for the artillery brigade of the Division, and the 6th for the Staff and men of the Divisional train.

It stands to reason that the entire Army cannot be immediately provided with the reorganized train. The new regimental train will be composed generally speaking of one-horsed carts, able to follow the troops wherever wheels can go. Only the ambulances and battery wagons are four-horsed. At the beginning of 1886 the following were already provided with the new regimental train, viz., the whole of the cavalry and artillery, almost all the rifle battalions, and a portion of the infantry Divisions. For these, therefore, it only remains to effect the necessary changes in the Divisional train, which is to be composed mostly of the two-horsed light wagons, pattern 1884, with some carts. For the present, however, until they are used up, the heavier two-horsed wagons, pattern 1876, are to be retained and drawn by three horses.

Disposition of a Russian Infantry Division on the March.

Paces		
350	<input type="checkbox"/>	I/1.
50		
600	<input type="checkbox"/>	1st heavy battery with train, 1 échelon.
50		
350	<input type="checkbox"/>	II/1.
50		
350	<input type="checkbox"/>	III/1.
50		
350	<input type="checkbox"/>	IV/1.
25		
150	<input checked="" type="checkbox"/>	Train, 1 échelon of 1st regiment.
Interval between regiments, 100		
350	<input type="checkbox"/>	I/2.
50		
600	<input type="checkbox"/>	2nd heavy battery, &c.
50		
350	<input type="checkbox"/>	II/2.
50		
350	<input type="checkbox"/>	III/2.
50		
350	<input type="checkbox"/>	IV/2.
25		
150	<input checked="" type="checkbox"/>	Train, 1 échelon of 2nd regiment.
Interval between brigades, 100		
1,550	<input type="checkbox"/>	3rd regiment.
25		
150	<input checked="" type="checkbox"/>	Train, 1st échelon of 3rd regiment.
100		
2,150	<input type="checkbox"/>	Artillery brigade staff, 1st light battery and train, 1 échelon.
	<input type="checkbox"/>	2nd ditto.
	<input type="checkbox"/>	3rd ditto.
	<input type="checkbox"/>	4th ditto.
100		
1,550	<input type="checkbox"/>	4th regiment.
25		
150	<input checked="" type="checkbox"/>	Train, 1 échelon of 4th regiment.
500	to	8 kiloms.

2nd échelon of train	300	☒	Divisional ambulance.
	25		
	275	☒	" hospital.
	25		
	50	☒	Train of divisional staff, and commander 1
	25		brigade.
	600	☒	" 1st regiment.
	25		
	90	☒	" 1st heavy battery.
	25		
	600	☒	" 2nd regiment.
	25		
	90	☒	" 2nd heavy battery.
	25		
	615	☒	" 3rd regiment.
	25		
	400	☒	" staff of artillery brigade and 4 light
	25		batteries.
	600	☒	" 4th regiment.

At an interval of a day's march.

Divisional train	275	☒	1 Divisional hospital.
	25		
	700	☒	Staff of Divisional train and general column.
	25		
	1,900	☒	Expense transport.
	25		
	2,100	☒	Reserve transport.

When these accompany column—

Artillery park.
Engineer park division.

It has been decided to increase the number of subaltern Officers in the infantry on a peace footing by 7 per regiment, and in the rifle battalions by 2 per battalion, which will greatly decrease the difficulty experienced on mobilization of obtaining sufficient trained Officers. The total number of Officers on a peace footing will henceforth be 70 per regiment and 19 per rifle battalion, and on a war footing 79 per regiment and 21 per battalion, so that an increase of only 3 per battalion in the infantry and 2 in the rifles will be required to complete them. At the beginning of the year the Guard regiments, those of the 6th Army Corps, and the rifle battalions had already been completed to the new establishment. The formation of two new battalions, the 7th and 8th, to the Transcaspian Rifles was ordered in the autumn of 1885, and effected by the transfer of complete companies from the infantry Divisions of the Charkoff and Moscow districts.

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There have been various changes in regard to several branches of the artillery. Three new foot mountain batteries of 4 guns were formed in Kieff, and placed under the command of the garrison artillery there. On mobilization these would be formed into 6 mountain batteries of 8 guns. The whole of the necessary material for this is kept ready on the spot in peace-time. The Turkestan mounted mountain battery which formerly had 8 guns has been reduced to 6 guns. A new garrison artillery battalion has been formed at Novo-Georgijevsk and Brest-Litovsk, and 2 at Ivangorod, bringing the total number up to 48. In addition to this, the 2nd and 3rd battalions at Dinaberg and the 3rd battalion at Warsaw have each been increased by a 4th company.

New formations have been created in five of the larger fortresses with a view to providing special batteries for sortie purposes in case of siege. The garrisons and both the immediate and eventual formations are given in the following table:—

Garrison.	Number of the battery in peace.	Number of guns in peace.	Number and designation of the sortie batteries in time of war.	Number of guns and ammunition wagons per battery.	
				Guns.	Ammunition wagons.
Warsaw	No. 1	2	4 (Nos. 1 to 4 Warsaw)	8	2
N.-Georgijevsk	" 2	2	4 (Nos. 1 to 4 N.-Georgijevsk)	8	2
Brest-Litovsk	" 3	2	3 (Nos. 1 to 3 Brest-Litovsk)	8	2
Ivangorod....	" 4	2	2 (Nos. 1 to 2 Ivangorod)	8	2
Kovno	" 5	2	3 (Nos. 1 to 3 Kovno)	8	2

Alterations have also been made in the disposition of the Ersatz artillery. The 5th and 6th batteries of the 2nd Reserve Artillery Brigade have been converted into a 1st and 2nd Ersatz foot battery of 2 light guns, and 2 light and 2 horse artillery guns respectively. These are temporarily placed under the commander of the garrison artillery at Dinaberg, and form on mobilization 8 independent Ersatz batteries. They are intended to be distributed immediately in rear of the operating army, and to provide for the actual completion of the batteries in the first line in men and horses. This arrangement does not interfere in any way with the total number of the Ersatz batteries, but is only intended to give effect to a new and practical manner of completing the batteries in the first line.

Whereas hitherto each of the 48 Ersatz batteries distributed throughout Russia had to provide for the completion of the corresponding 48 active artillery brigades, this is now done through the intermediary of the 8 new batteries.

Of the total 48 Ersatz batteries, 40 are formed from the 5th and 6th batteries of the 5 reserve foot artillery brigades, and form 5 Ersatz artillery brigades. Each of these brigades has 8 batteries (Nos. 1 to 8), of which 37 are light and 3 mountain batteries. Each battery has 4 horsed and 4 unhorsed guns. The 8th batteries have 4 light and 2 horse artillery guns.

Of the 8 independent batteries which complete the 48, the 1st to 7th have 4 light guns, the 8th 4 light and 2 horse artillery guns.

In the field the 40 batteries of the Ersatz brigades in rear feed the 8 independent batteries, which in their turn complete the 1st line.

The following table shows the disposition of the entire field artillery, including the newly-formed batteries on a war footing.

Distribution.	Number of batteries.					Number of guns.				
	Heavy.	Light.	Horse artillery.	Mountain.	Total.	Heavy.	Light.	Horse artillery.	Mountain.	Total.
I. Field Artillery—										
1. <i>Foot Artillery.</i>										
3 Guard artillery brigades	6	12	..	..	18	24	48	..	..	—
4 Grenadier "	8	16	..	..	24	32	64	..	..	—
41 Army "	82	152	..	12	246	344	628	..	68	144
1 Turkestan "	2	3	..	2	7	12	24	..	16	16
1 W. Siberia " .....	..	3	..	1	4	..	24	..	8	24
1 E. Siberia " .....	..	1	..	3	4	..	8	..	24	96
Foot mountain batteries in Kieff .....	..	..	..	3	3	..	..	..	12	24
Total foot artillery	98	187	..	21	306	412	796	..	128	304
2. <i>Horse Artillery.</i>										
1 Guard horse art. brigade (including Guard Don Cossack battery) .....	..	..	6	..	6	..	..	36	..	36
28 Army artillery brigades .....	..	..	23	..	23	..	..	138	..	138
Army Don Cossack horse art. brigade..	..	..	21	..	21	..	..	126	..	126
5 Kuban " " " .....	..	..	5	..	5	..	..	30	..	30
2 Terek " " " .....	..	..	2	..	2	..	..	12	..	12
Orenburg " " " .....	..	..	6	..	6	..	..	36	..	36
Transbaikal " " " .....	..	..	3	..	3	..	..	18	..	18
1 Turkestan horse mountain battery ..	..	..	..	1	1	..	..	..	6	6
1 W. Siberian " " " .....	..	..	..	1	1	..	..	..	8	8
Total horse artillery .....	..	..	66	2	68	..	..	396	14	410
II. Sortie Artillery—										
Sortie batteries .....	..	16	..	..	16	..	128	..	..	128

Distribution.	Number of batteries.					Number of guns.				
	Heavy.	Light.	Horse artillery.	Mountain.	Total.	Heavy.	Light.	Horse artillery.	Mountain.	Total.
III. <i>Reserve Artillery</i> —										
20 Reserve foot artillery brigades	20	60	..	..	80	160	480	..	..	640
IV. <i>Ersatz Artillery</i> —										
Independent Ersatz batteries .....	..	8	..	..	8	..	32	2	..	34
5 Ersatz artillery brigades .....	..	37	..	3	40	..	148	10	12	170
1 Don Cossack " " .....	..	..	1	..	2	..	..	4	..	4
1 Orenburg " " .....	..	..	1	..	2	..	..	4	..	4
Total Ersatz artillery ....	..	45	2	3	50	..	180	20	12	212
II. <i>Instructional Artillery</i> —										
1 Instructional foot battery.....	..	1	..	..	1	..	8	..	..	8
1 Instructional horse art. battery ....	..	..	1	..	1	..	..	6	..	6
Total instructional artillery	..	1	1	..	2	..	8	6	..	14
Grand total	118	309	69	29	525	944	2,292	422	218	3,876

Servia.

The mobilization of last September extended to the whole of the 1st levy and a portion of the 2nd, but as a matter of fact the former was not completed on a war footing. In accordance with the scheme in force the 1st levy, which includes the ten yearly classes aged from 20 to 30, together with the Ersatz formations, should form on mobilization 20 infantry regiments (including 5 Guard regiments) of 4 battalions; 5 cavalry regiments of 4 squadrons; 5 artillery regiments of 8 batteries (6 guns), and 5 pioneer companies, the whole formed in 5 divisions; and in addition 1 guard squadron, 1 mountain artillery regiment of 6 batteries (of 4 guns); 1 garrison artillery battalion of 4 companies and 2 pioneer companies under the direct orders of the Commander-in-Chief of the Army. The effect of the mobilization, however, was restricted to the completion of the 15 line regiments to 3 battalions only, of the 5 cavalry regiments to 3 squadrons, and the 5 artillery regiments to 4 batteries, while of the Guard battalions only 4 were brought up to a war strength, and the 3 mountain batteries already existing were not increased.

The result of this partial mobilization of the 1st levy was to put into the field a force consisting of 49 battalions, 16 squadrons, and 23 batteries, and numbering in round numbers 55,000 men, or about 41,000 combatants, 1,600 cavalry, and 132 guns.

The 2nd levy, including the seven yearly classes from 31 to 37 years of age, is estimated to form 60 battalions, 10 squadrons, 20 mountain batteries, and 5 pioneer companies. Of these, only 5 infantry regiments and 2 squadrons were at first formed and 2 more regiments later on. Reckoning these regiments of the 2nd levy at 3 battalions, the whole of the Serbian forces in the first line were composed of 70 battalions, 18 squadrons, and 23 batteries, amounting to a fighting strength of 53,000 men, 1,800 horses, and 132 guns.

The incomplete and unsatisfactory result of the mobilization was due to several causes. The existing organization was of comparatively recent date, the cadres had been fixed at far too small a strength, there was great difficulty in obtaining the number of horses which were required, and lastly money was not easily forthcoming. But in addition to these difficulties, it was never contemplated that the resistance of Bulgaria would be of such a nature as to call for any serious effort on the part of Servia.

The want of Officers and non-commissioned officers consequent on the weak effective of the permanent cadres was severely felt. Notwithstanding that an addition was made to these of five battalions in 1885, the total strength of the cadres did not exceed one-fourth of the estimated war strength of the 1st levy. This proportion could not possibly admit of the necessary number of Officers and non-commissioned officers for the new formations, and the want of them was felt the more that the training of those forthcoming was far from satisfactory.

For the 2nd levy no permanent cadres are maintained, and consequently even greater difficulties were experienced in its mobilization, and such Officers and non-commissioned officers as were allotted to it could only be obtained at the expense of the 1st levy. In order to meet in some degree the want of Officers, the senior classes in the Military Academy were drafted into the Army. The difficulty of obtaining the required number of horses was increased by the decision only to buy them in the country.

As regards the embodiment of the men the mobilization was effected with great rapidity. The order was issued on the 24th September, the first of the reserves came up as early as the 26th, and on the 1st October the concentration of the Army was commenced. This was effected principally by rail, and by the 11th October it was generally speaking completed and the fighting troops were in position; but the train was not ready.

The armament and equipment of the Army was in many respects unsatisfactory. The infantry was armed with the Mauser-Koka rifle, and the cavalry with excellent repeating carbines. On the other hand the field artillery was mostly furnished with the La Hitte gun, an arm not equal to the present requirements; four batteries only had Krupp guns, previously captured from the Turks, and of these some were defective from use. The ammunition forthcoming was lamentably insufficient, only from 3 to 4 million cartridges being available for the infantry. The ammunition for artillery was also wanting, and at Pirot the batteries fell short of shell.

The defeat of the Servian troops is in part to be attributed to the incomplete training of the men. By the Recruiting Law of 1883 those liable to service are divided into three categories, of which the 1st class have to serve two years with the colours, the 2nd class five months, and the 3rd class only one month, consequently the training was unequal, and for a large proportion quite useless. But beyond this, owing to financial considerations, the permanent strength was reduced from 20,000 to 12,000, and the efficiency of the men was still further reduced.

The result of this state of affairs was that when the troops came into action it was found impossible to keep the firing in hand. Some of the troops opened fire at a range of 3,000 metres, and could not be stopped until all their cartridges were expended. At close ranges again they could not be restricted to firing volleys, but fell into an irregular independent firing. Their outpost duty was very defectively performed, and they could not be brought to stand against the bayonet attack of the Bulgarian troops at close quarters.

The small result obtained by the Servian field artillery was attributable in part to its defective material, but partly also to the manner in which it was handled. Fire was generally opened at so great a distance that the projectiles did not reach the enemy's troops, and during the course of the actions the artillery fell into the mistake of directing its attention to the opposing guns, and thus facilitated the advance of the Bulgarian infantry.

The defective organization of the train and the want of administrative ability on the part of the Intendance further contributed to the unsuccessful result of the campaign. During the advance the columns did not manage to keep up with the troops, and the latter suffered severely, whole divisions being left days without the issue of provisions. The same delay was experienced in bringing up the ammunition columns, and the deficiency in ammunition was in part attributable to this.

When the Servian advance came to a standstill at Slivnitza, the complete mobilization of the 2nd levy was proceeded with, which produced an addition to the Army of from 35,000 to 40,000 men.

Turkey.

The Turkish Army consists of 13 army corps, of which the first 12 are formed two from each of the six Provinces (Ordu). The headquarters of these army corps are, 1st and 2nd, Constantinople; 3rd, Adrianople; 4th, Salonica; 5th and 9th, Kossovo; 6th, Monastir; 7th, Erzeroum; 8th, Erzincan; 10th, Damascus; 11th, Mossul; and 12th, Bagdad. The 9th army corps is recruited from Syria, but has its headquarters in Albania, and the depôts alone in Syria. The 13th army corps is stationed in Yemen, but is completed from the superfluous Ersatz men of the other 12 army corps. The Candia brigade has its own special organization.

Obligatory service is universal for the Mahommedans, but Christians may buy themselves off. The term of service commences at the age of 20, and is divided into 7 years with the Active Army (Nizam), of which 4 years in the

Reserve (Ichtiat), 7 years in the Landwehr (Redif), and 6 years in the Landsturm (Mustafiz).

The state of the Turkish Army at the commencement of 1885 was 264 infantry battalions, 189 squadrons of cavalry, 104 field batteries, 36 mountain batteries, 8 garrison artillery battalions, 19 engineer companies, 5 infantry train battalions, 1 field telegraph company, besides artificer formations. The strength of the force amounted to 9,815 Officers, 149,144 men, 22,025 horses, and 3,202 field and fortress guns.

The 264 infantry battalions were formed into 63 regiments of 4 battalions, except 1 with 5 and 4 with 3 battalions. The peace establishment was 590 men per battalion, but some had 600 men, and some as few as 200.

The cavalry formed 38 regiments, all of 5 squadrons, except 1 which had only 4. The strongest squadrons had 120 men and 70 horses, but many had hardly any horses at all. The establishment was 125 men and horses.

The field artillery numbered 8 regiments, generally of 12 field and 2 mountain batteries, but some had more, and others much less. On an average each battery had 6 guns, all Krupps.

The distribution of the rationed strength of these formations was as follows:—

Distribution.	Men.	Horses.	Guns.		
			Field.	Mountain.	Fortress.
1 Corps at Constantinople and Smyrna.....	22,258	2,658	96	16	314
Tophané troops under the Inspector-General of Artillery.....	12,052	638	48	6	827
2 Corps at Adrianople.....	9,246	2,039	36	—	—
3 „ at Monastir and Dibre....	7,105	1,847	48	16	—
Kosovo Corps.....	12,071	2,572	52	18	80
Scutari Division.....	4,505	301	18	6	57
Janina „.....	4,274	385	6	12	191
Naslitsch „.....	5,971	1,164	6	12	—
Salonica „.....	5,867	1,471	12	6	82
4th Army Corps.....	21,282	3,510	120	36	350
5th „ „ in 5th Ordu District.....	12,701	1,270	72	18	110
6th Army Corps.....	12,602	2,938	60	10	—
7th „ „.....	13,326	631	18	20	78
Mecca Division.....	2,827	116	..	6	57
Crete „.....	4,582	563	12	24	99
Tripoli „.....	8,290	922	18	—	129
Total.....	158,959	23,025	622	206	2,374

In April, 1885, the threatened hostilities between England and Russia led to the Porte taking steps to maintain the neutrality of the Dardanelles and the Bosphorus. Acting on the Report of the Commissions, composed of Turkish Officers and German Officers in the Turkish service, the old fort on the southern entrance of the Dardanelles on the Asiatic side, called the Korum-Kaleh-si, was repaired and armed with 7 heavy Krupp guns, some of the uncompleted high-level batteries were finished, and the inner line of obstructive mines at Chanak-Kaleh-si renewed and protected by mitrailleuse

batteries on either shore. The telegraphic communication between the several defences of the Straits, which was generally defective and in some instances altogether wanting, was completed and placed in an effective condition. The high-level batteries were armed with 60 Krupp mortars. The works on the Bosphorus were restricted to the construction of two high-level batteries. The armaments were increased by the following guns, all from Krupp :—

7 80-ton coast guns.
22 of 24 cm. "
430 field guns.

In September, 1885, the outbreak of the East Roumelian province led to the mobilization of the Turkish Army. The result of this at the beginning of March, 1886, was the following :—

Mobile Troops.

	Battalions.	Squadrons.	Field batteries.	Mountain batteries.
<i>In Europe and Candia—</i>				
Nizam	106	74	63	26
Redif I	128	—	—	—
" II	96	—	—	—
Redif battalions formed from excess in numbers required as above	20	—	—	—
<i>In Asia—</i>				
Nizam	53	59	24	5
Redif I	10	—	—	—
Redif II	42	—	—	—
Total	455	133	87	31
<i>Immobile Troops.</i>				
Constantinople.....	23	23	22	3
In Europe.....				
Asia and Tripoli		40	18	7
Total	111	63	40	10

The total rationed strength of the whole of the above troops amounted to about 475,000 men.

The mobile portion of this force was distributed as follows :—

1st. *The Adrianople Army*, under Muschir Tahir Pasha, composed of 5 divisions with 80 battalions (24 Nizam, 56 Redif), 20 squadrons, 14 field and 4 mountain batteries; or about 56,000 infantry, 2,600 cavalry, 84 field and 25 mountain guns.

2nd. *The Army of Macedonia and Albania*, under Muschir Weissel Pasha, 6 Divisions, consisting of 109 battalions, 22 squadrons, 22 field and 12 mountain batteries; or about 76,000 infantry, 3,080 cavalry, 132 field and 72 mountain guns.

3rd. *The Army on the Greek Frontier*, under Muschir Achmed Eyoub Pasha, having a strength of 9 Divisions, with 136 battalions, 30 squadrons, 26 field and 6 mountain batteries, numbering 95,200 infantry, 4,200 cavalry, 156 field and 36 mountain guns.

4th. *The Force on the Montenegrin Frontier*, of 10 battalions, under Muschir Mustapha Assim.

5th. *The Force in Candia*, 15 battalions (8 Nizam, 7 Redif), 2 squadrons,

1 field and 4 mountain batteries ; about 10,500 infantry, 280 cavalry, 6 field and 24 mountain batteries, under Savas Pasha.

The numbers rationed with the mobilized armies in the Balkan Peninsula and in Candia amounted to 317,600 men.

The manner in which the mobilization was carried out was generally very satisfactory, and showed marked progress over that of the preceding year. Although the Turkish organization cannot boast of any minute preparation during peace-time for eventual mobilization, the machinery, such as it was, worked smoothly and the men came in rapidly. The embodiment of the Redif formations was carried out with extraordinary rapidity, considering the generally slow movements of the Turkish administration. The first battalions on the Asiatic coast were formed in the prescribed strength, and ready to march in from seven to ten days. The prompt transport of the Asiatic Redif formations to the points of concentration in the Balkan Peninsula was no less remarkable. The first embarkation was made on the 6th October, and by the 31st of that month 90 battalions had been landed on the European coast.

In some districts the men came in in such numbers that an extra battalion was formed. Only in Macedonia and Albania was there any serious deficiency in the numbers that came up. As regards the efficiency of the Redif, the result was not so favourable, for it appears from the official lists, that of the 266,000 1st class and 257,000 2nd class, only about 113,000 of each had received any military training.

The establishments of the several units was fixed at 700 rifles for the infantry battalions, 140 horses per squadron, and 6 guns per battery, which were completed early in 1886, while many of the Redif battalions were considerably over their establishment.

As regards the armament of the troops, the infantry were all armed with the Henry-Martini rifle, for which an abundant supply of ammunition was available. At the commencement of the mobilization the guns ordered from Krupp had not been delivered, and the newly-formed batteries were provided with guns manufactured in the Arsenal.

In March, 150 guns with equipment complete were received from Krupp, and 426, a second instalment ordered in February, had still to be delivered. Horses for the cavalry were for the most part purchased in the country, and those for the artillery abroad. Of the former 5,000 were obtained, mostly from Kurdistan, and 4,500 were purchased in Hungary, of which 3,000 for the artillery. The saddlery was obtained through German firms.

The clothing and equipment of the troops was good and almost entirely new, part of the former being obtained from Germany.

The train and sanitary columns were altogether wanting, but the former deficiency was met by allotting 60 mules or ponies to each battalion. The troops were rationed by the occupied provinces, in which the tithe tax was remitted, so as to make up for this.

All the reports regarding the forces agreed in saying that they were in good condition and fit to take the field—though the training of the men left much to be desired. But it must be regarded as a very satisfactory earnest for the future of the Turkish Army, that after an interval of only seven years since an arduous war, Turkey should be a position to place in the field, under her new organization, so formidable a force, superior in every respect to that which she opposed to Russia in 1877-78.

Infantry Tactics.

The development of infantry tactics during the year 1885 followed the course marked out by the experiences derived from the Franco-German and Russo-Turkish campaigns. One of the most important conclusions arrived at

from these experiences is that, opposed to the present infantry fire, an unsuccessful attack means, if not the destruction of the troops, at least their being withdrawn out of the fighting line. A successful attack on open ground is the highest feat of arms of which the infantry soldier is capable, and it requires more than ever, besides energetic execution, a careful methodical preparation. The battles of St. Privat and Plevna proved the necessity for raising the musketry training of the soldier to the same high level as the mechanical excellence of the arm he carries. In the absence of a thorough training in firing, combined with strict fire discipline and careful control of the fire by all subordinate commanders at least up to the battalion commander, troops armed with long-range, rapid-firing rifles will inevitably fall into independent firing at long distances, when all the advantages to be derived from unity of action will be lost. This is the defective point in the new magazine rifle about to be issued to the troops. Even in the hands of such unformed soldiers as the Turks, considerable results were obtained at enormous distances, at which their opponents suffered appreciable losses; but the expenditure in ammunition amounted in several engagements round Plevna to as many as 500 rounds per man. Notwithstanding this wholesale expenditure the Russians captured in the course of the war 500,000,000 cartridges. There is no doubt that it would be simply impossible to carry even a quantity approximately as great for the use of large armies on the move. This being so, the only alternative is to restrict the fire, making up for this by a training which will ensure the utmost possible results being gained by it. This view has been very generally accepted, and the consequence is that all the military States are vying with one another in making practical instruction in fire tactics the most important factor in the soldier's peace training.

Most of the regulations and musketry instructions restrict the employment of rapid fire to distances of from 200 to 400 metres; but it is to be noticed that the new German regulations do not do this. The evils which may result from the employment of this mode of fire at greater distances, such as unsteadiness in the troops and the insufficiency of the results obtained, are dwelt upon; but it is left to the discretion of those in charge of the several units to use it when the special circumstances may appear to them favourable to its employment. The Prussian Guard suffered its greatest loss at St. Privat, at a distance from the enemy of over 500 metres; some regiments even lost most of their Officers at 800 metres distance. The Russians experienced the same at Plevna and Gorni-Dubnik. Only rapid fire at unfavourable objects, under bad leading and with insufficiently trained troops, can be regarded as ammunition thrown away. With well-trained infantry, armed with a rifle with sufficient range, a flat trajectory and good penetration, the distance should in future play a secondary part. Long-range fire, both independent and volley, will be regarded as a fundamental instruction rather than as an occasional practice.

A further question awaiting solution is the employment of indirect fire against an object covered in front to an inconsiderable height only, so as to be able to assist an attack in front by infantry, by means of the fire of special bodies posted outside the sphere of the actual attack, and forming what the French call "*batteries de fusils*." This question can only be finally settled in a future campaign; but there can be no doubt that the army which has been best trained in the application of indirect fire, so far as its development can be effected on theoretical principles alone, will have a considerable advantage when the time comes for its employment in the field.

The actual adoption of a repeating rifle was long deferred, but it is now understood to have been decided on in favour of an arm which, while it has the repeating mechanism entailing considerable extra weight, is lightened by means of a diminution in the bore, having the additional advantage of

reducing the weight of the ammunition. The pattern adopted was issued this year to a large portion of the troops taking part in the autumn manoeuvres, and it is pretty certain that its general issue will follow without delay. At the same time a new pattern pack was tried, which has the advantage of increased lightness over the old. This is the more necessary that the possession of a repeating rifle will entail the troops carrying an increased number of cartridges, which could not be done if the soldier were to continue to carry the existing pack, which may be taken on an average to weigh, with other equipment, about 60 lbs.

The new regulations for the drill and exercise of the French Army were completed in 1885 by the publication of Part V, embracing the regiment, brigade, and Division. The probable course of an action in which an isolated Division on the march becomes engaged is given in the concluding chapter. The Division advancing on one road sends an advance guard forward composed of 3 battalions and 1 battery; 2 companies bring up the rear. The Divisional cavalry regiment sends out 3 squadrons to clear the advance and reconnoitre; the 4th squadron provides for the protection of the column on both flanks. During the march the Divisional Commander, Generals, and other Commanding Officers should study the ground with a view to an eventual action, the place of the Divisional Commander being with the advanced guard. Upon coming into contact with the enemy, the cavalry seeks to drive in that opposed to it and to reconnoitre the ground up to the enemy's position. The advanced guard deploys for attack, as ordered by the Divisional Commander, who, with his staff, goes forward to reconnoitre, and gives the Commanding Officers their orders. Salient points of the enemy's position should, with the assistance of the artillery, be first seized, and placed in a state of defence so as to be used as points of support during the further course of the action. The employment of the reserves generally is left to the regimental and brigade commanders, but the regiment in the third line only receives its orders directly from the Divisional Commander. The bodies detached to attack the enemy's flanks should keep their movements masked as long as possible; but as soon as they reach the position most favourable for attack they must carry this out with the utmost energy, supported by the concentrated fire of all the batteries. This moment must be seized by the troops attacking in front to redouble their efforts, so as to prevent the enemy from detaching reinforcements to the flanks.

In the event of the attack succeeding, the regiment of the third line and all the batteries move into the captured position in order to break the last resistance of the enemy and prevent him from taking up position again further back, while the first and second line re-form. The cavalry maintain their touch of the retiring troops and attempt to gain their line of retreat. As soon as the whole infantry have re-formed they follow in energetic pursuit.

Should the attack fail, the cavalry, artillery, and third line, so far as it is not engaged, have to cover the movement in rear, after which a fresh attack can be undertaken after the necessary preparation. If it should be indispensable to give up the attempt altogether, the previously prepared points will be occupied under cover of the cavalry and artillery so as to secure the retreat. The strength and formation of the rear guard during the further retirement must be dependent upon the attitude of the enemy, who must be held at any price, and the ground only evacuated step by step.

Material progress has been made by the French Army during recent years in the use of the rifle, and the question of indirect fire has lately been much debated. The interest shown in the improvement of the soldier's firing has extended beyond the Army, as is demonstrated by the fact that the number of "shooting societies," which at the beginning of 1883 was 232, has in-

creased to 502. The Departments bordering on the German and Belgian frontiers are the most forward in the movement. The competitions are carried out with the Army rifle at ranges of from 200 to 300 m., and all the societies are represented by several members at an annual rifle meeting which takes place at Vincennes.

The question of the adoption of a repeating rifle has not yet been definitely solved in France. The Kropatschek rifle issued to the Marines in 1878 was first put to the test of active service in Tonquin, and in 1884 other infantry regiments there were armed with it. Official reports express satisfaction at the result, which is not echoed by independent critics; "La France Militaire," for instance, maintains that the employment of the repeating rifle must infallibly lead to the troops armed with it being forced to adopt the defensive.

However this may be, the trial of new patterns has been uninterrupted, and lately 100 men of each of the 24 rifle regiments have been armed with the Gras rifle converted on the Kropatschek system, which is very favourably reported on.

The training of the troops in field work of every description has been carried out with the greatest zeal and energy, and a novel element introduced by the practice of crossing rivers by swimming. At Blois, 25 men of the 31st Regiment swam across the Loire and back, a breadth of over 100 m., with their arms and ammunition, which were used by the men on the opposite bank. Great importance is given to route march, and a remarkable performance was reported of the 24th Rifle Battalion, which marched 109 kilometres in 36 hours, with complete kits, without a man falling out.

In the Russian Army the most noteworthy point has been the development of the rifle training of the infantry. As an exercise in field firing a report is given of the performances of a force consisting of a battalion at war strength, 8 guns, and 2 sotnias of Cossacks. The 1st company fired 1,248 cartridges at a distance of 1,450 paces at a covered object, and made 10 per cent. hits. The 2nd, 3rd, and 4th companies fired 8,375 cartridges at the same distance at a visible object and made 30 per cent. hits. The issue of ammunition was made by means of a horse carrying 4 cartridge bags, each containing 24 packets, each weighing 35 lbs., and making in all 1,440 rounds. The horse was kept under cover behind the reserve company, and on the order, 4 non-commissioned officers each took a bag and carried it to his company; 15 paces behind the group-leaders he deposited the bag and threw the packets to them.

Similar field-firing, simulating as far as possible the conditions of actual warfare, was carried out by Austrian troops at the Brück camp. The artillery fire being conducted from 3,000 to 1,000 paces, and that of the infantry from 1,400 to 300, the defensive position being marked in part by figure disappearing targets, and shrouded with smoke. A repeating rifle, on the Mannlicher system, which it is proposed to adopt, has been exhaustively tried, and it is claimed for it that it is capable of firing 30 rounds per minute.

A new rifle instruction has been adopted for the Italian infantry, replacing provisional instructions issued last year. Independent firing at single individuals at distances over 400 metres is forbidden; great stress is laid upon rapid aiming, exercise in quick firing, and judging distance, for which prizes are to be given. Independent and volley firing is practised at distances from 300 to 1,600 m. at targets representing skirmishing lines, columns, and guns. There is no regular classification, but 3 non-commissioned officers and 24 men who are the best shots as decided by an annual competition receive prizes and wear badges. National rifle associations were established in each province in 1882, the Government providing arms.

Two important changes have been made in organization, by which the

peace strength of companies was raised from 90 to 100 men, and all infantry Captains are to be mounted.

In Belgium the new field exercise book, commenced in 1884, was completed.

As regards the company, the French formation of line of peloton-columns has been adopted, by which the company is formed into three small columns with half intervals, which is considered handier than the ordinary company columns. With a view to obtaining a closer connection between the skirmishing line and its support, both of these are taken from the same subdivision. The leading half of two of these form the skirmishing line together, and are supported by the other halves in close order at a distance not exceeding 200 m. On the defensive whole subdivisions may form the skirmishing line. Reserves in close order cross open ground under fire by successive rushes of squads or half subdivisions from cover to cover. The extension of front is in no case to exceed the double of the deployed company. Whistles are only to be employed to attract the attention of skirmishers and bugle sounds to prepare for cavalry, to commence independent fire, to cease fire, to charge, and to assemble.

A company not acting independently forms in open ground for attack, at 1,400 m., line of peloton-columns. Scouts are then sent forward on whom the leading half subdivisions form the skirmishing line, the supports and reserve follow. When the supports join the skirmishing line the reserves close to 200 m. from it. Independent fire is commenced at 200 to 300 m. from the enemy; on the signal to advance the line moves forward again by rushes, between each of which a round is fired; the charge follows at 150 m.

A company fighting alone must always combine the front attack with a demonstration against some special point on the enemy's front or flank. On the defensive special bodies are told off for attacks against the attackers' flank.

The rules for the conduct of a company are to be followed, so far as these are applicable, with a battalion. Where this is not acting independently, company-columns will be formed as soon as it comes within the range of rifle fire; in open ground it will be formed in two lines at a distance of about 3,000 m.; the first line, generally the two flank companies, advances about 300 m., halts, and sends out the leading half subdivisions as skirmishers, and forms a fighting line as directed for the company.

The instructions for the formation and conduct of a Division in action resemble very closely the French regulation; but it is somewhat remarkable that they prescribe for the defence the occupation of advanced posts, such as woods and farms, even when at a distance of 800 to 1,200 m. from the front, so as to force a deployment upon the enemy. This is hardly in accordance with past experience, which shows the occupation of isolated posts so far removed from the general line of defence to be a source of weakness, and as they are generally untenable when the deployment of the enemy has been effected, retirement from them tends to demoralize the defenders.

The artillery at the commencement of an action is directed to open fire when possible from favourable positions at about 1,800 m.; but during the last phases of the attack where necessary to approach as near as 700 m. The battalions in reserve have, during the course of the action, to advance gradually nearer to the fighting line. For a Division separately engaged a front of 2,300 m. is prescribed, which may be increased to 3,000 m. in cases where by doing so a support is to be obtained for both flanks.

The Tactics of Field Artillery.

This subject has been exhaustively dealt with in a work by General Kraft, Prince of Hohenlohe-Ingelfingen, in which the following principles are adopted.

In the organization of field artillery it is desirable that 3 artillery regiments should be allotted to each army corps ; 1 regiment of 2 divisions of 3 batteries per infantry division, and the army corps artillery, consisting in peace of 1 regiment of 3 divisions of 3 horse artillery batteries, from which in war the necessary batteries for the cavalry divisions would be detached. The retention separately of the army corps artillery is strongly insisted upon, so as to enable the General commanding to apply it promptly wherever a concentration of guns is required by the situation.

The two most important requirements to ensure the efficiency of the artillery are that it should be highly trained in firing, and be able to make rapid and lengthened marches. As regards its employment every effort must be made to gain from the first a superiority in fire over the enemy's artillery.

The advanced guard of an army corps—one infantry brigade—should be accompanied by one division of artillery, the second remaining with the 2nd infantry brigade. The artillery of an advanced guard marches in rear of the first battalion or regiment of the main body ; that of a division in rear of the first regiment or at least of the first brigade ; the corps artillery behind the first brigade of the main body or at least after the first division.

In action the artillery must avoid all objectless firing, and to do this should approach as near as possible to the enemy. As a rule, however, it must at first be kept out of the reach of shrapnel or at about $3\frac{1}{2}$ kilometres. The decisive artillery duel will take place at from 2 to $2\frac{1}{2}$ kilometres. In the offensive the artillery cannot approach intact and otherwise unoccupied infantry nearer than 1,500 to 1,600 m. But if the infantry is already kept in check by infantry or artillery, the advance may be made to within 1,000 to 1,100 m. During the decisive action of the infantry it must not hesitate to come to the closest quarters.

On the defensive the normal situation of artillery is 500 m. behind the advanced infantry, when by being placed there the field of fire is not restricted. The artillery must on no account leave these positions unless the order is given for a general retreat.

The changes advocated by Prince Hohenlohe would increase the mobility of the artillery, which is in itself very desirable ; but it would be at the expense of weight of metal, for three-sevenths of the batteries would according to his proposal be horse artillery with a lighter gun than the field batteries.

The question of the organization and employment of horse artillery was considerably discussed in 1885, but without any very definite decision being arrived at. The restriction of the number of guns to be attached to a cavalry division to one battery was advocated, on the ground that the presence of more guns seriously retards the movements of a force, and that the necessity for the employment of artillery with a cavalry division is the exception rather than the rule. Theoretically, the presence of several batteries with their wagons would no doubt be a drag on the movements of the division, but as a matter of fact, where it can go with its own provision train and ambulances, and the 17 heavy wagons of one battery, it can go with those of three and at approximately the same rate. Where it comes to rapid movement, the train, &c., must in any case be left behind, and the 18 guns with their limbers will travel as fast as six. But even were this not so, it cannot be admitted that one battery is by any means sufficient artillery for the purposes of a cavalry division, and while some authorities have advocated two, others, and amongst them Prince Hohenlohe and General v. Verdy, advocate three.

Fortress Warfare.

There is not much to be recorded for 1885 in connection with this subject. The development of the means of communication by means of pigeons and

balloons was actively prosecuted. France may be said to have always taken the lead in the movement, and satisfactory results had previously been obtained from the employment of a captive balloon in Tonquin, while a further advance was made last year. An *aéronautic* school was established at Grenoble, which, while it was less considerable than that of Meudon, is to serve the purpose of training a section of engineers in the use of the captive balloon for reconnoitring purposes. In regard to communication by means of the pigeon-post, a Decree was issued by the Government providing for the requisition of carrier-pigeons in case of war, and prescribing their being annually registered throughout the country in the same manner as horses and carts.

Italy has also been busy experimenting with captive balloons with very satisfactory results. A balloon detachment has been added to the telegraph division of the 3rd Engineer regiment at Rome. A carrier-pigeon station has been established at Ancona.

In Russia a balloon obtained from the French War Department was used, and a voyage made in it from St. Petersburg to Novgorod; and a trained detachment has been formed on the German pattern attached to the engineers. Balloon stations are to be formed at various points for experimenting and training.

In Italy material progress was made with the completion of the system of defensive works adopted, and large sums were voted for their continuation, but not without considerable opposition. The principal works to be undertaken this year were at Spezzia, besides other coast works and forts for the frontier passes.

THE RUSSIAN TRAIN ACCORDING TO THE NEW ORGANIZATION.

By Major-General M. A. HAZENKAMPF.

(Translated from the "Russian Military Magazine" by Captain J. WOLFE MURRAY, R.A., D.A.Q.M.G.)

IN order to form a comprehensive idea of the purport of the following article and for facility of reference, the following brief notes as to the organization of the Russian Army are given :—

Infantry.

An Infantry Division consists of 2 brigades, each of 2 regiments : a regiment is composed of 4 battalions (roughly of 1,000 men each) of 4 companies.

Artillery.

To each Infantry Division there is attached a brigade of artillery, consisting of 6 batteries of 8 guns each. Generally speaking, 2 of these are heavy, and 4 are light field batteries.

To each Cavalry Division, 2 horse artillery batteries, of 6 guns each, are attached.

Cavalry.

A Cavalry Division is composed of 2 brigades of 2 regiments each ; the cavalry regiment has 6 squadrons, except in the Cuirassier regiments of the Guards, which have 4 squadrons. The first brigade of each Army Cavalry Division comprises 2 dragoon regiments ; the second brigade 1 dragoon and 1 Cossack regiment. The strength of a 6-squadron regiment may be taken approximately at 1,000 men.

Rifle Brigades.

These consist of brigades of 4 battalions, each battalion 1,000 strong. They are not attached to any particular Division or corps during peace ; but are distributed as required in war.

Engineer Troops.

The following are the principal units :—Sapper battalion, 1,000 men ; pontoon battalion, 594 men ; telegraph park, 250 men ; field engineer park, 200 men. Engineer troops are distributed among the corps as required in war.

Army Corps.

Army Corps consist of two or three Infantry Divisions, with their corresponding artillery brigades (there is no corps artillery), and one Cavalry Division. Engineer troops, &c., are allotted as required.

THE NEW ORGANIZATION OF THE RUSSIAN TRAIN.

The new regulations for the regimental and Divisional train, with their appended tables and establishments, were submitted to the Military Council on the 11th April, 1885, and after receiving the Imperial sanction, were promulgated in General Order No. 188 of 19th July, 1885.

These regulations were worked out by a special Committee on the organization of the troop trains, consisting of Officers of all branches of the Services and of officials of all the departments, selected by the War Minister from those who had taken part in the Russo-Turkish War, under the presidency of Lieutenant-General Baron Zeddeler.¹ Before being submitted to the Military Council, these regulations were repeatedly revised by the various departments at headquarters and in the military districts, and in addition they were considered in some districts by special Committees of representatives of all arms of the Service. The fundamental principles of the projected regulations, as well as the essential outline of the tables and establishments, were at once received with almost unanimous expressions of favour.² Beyond this, a few alterations were required to bring the proposals of the Committee into accord with the changes which were being effected by the Artillery Department, and by the chief Committees on military hospitals and on the organization and training of the troops; this last Committee has since been abolished. Lastly, a few changes were made in accordance with the final instructions of the Military Council on the 11th April.

All this required 3½ years. Meanwhile the technical section of the Committee carried out experiments with new types of vehicles, and in 1884 it finally adopted the new pattern of two-wheeled cart and of two-horsed wagon on Colonel Nikiforov's system.

The essence of the new regulations is as follows :³

The troop trains are divided into *regimental* and *Divisional* trains. The regimental train will carry only the most necessary stores, which the troops cannot possibly do without in action and in bivouac, even when in close contact with the enemy. Everything else is carried in the Divisional train.

I. Regimental Train.

Two conditions were taken as the measure by which to determine the nature and quantity of the stores to be carried in the regimental train, viz. : (a) Readiness for action, and (b) the possibility of sparing the troops from useless privations.

In accordance with these conditions, it was laid down in accurate detail for each independent unit what articles and how many of them should be carried in the train, and what the weight of the articles so carried should be. Accordingly all the stores of each independent unit are divided into two categories, viz. :—(1) Those belonging to the company or squadron, and (2) those forming part of the general regimental stores. In order to render the supplying of the troops thoroughly secure in case of the administrative units being broken up into fractions, the regimental train is so organized that each company, squadron, or battery has its own special vehicles; so that when any portion of the regiment is detached, its corresponding portion of the transport is detached with it.

The number of vehicles was calculated upon the quantity and weight of the stores carried, and on the dead weight⁴ of each vehicle, the two together forming the limit of weight.

¹ General Hazenkampf, a well-known authority upon military administration, and Professor of that subject at the Russian Staff Academy, was Secretary to the Committee.—Tr.

² Of 60 answers received, 57 were favourable.

³ There are appended to the regulations for the regimental train (1) instructions; (2) list of Officers' baggage; (3) 19 detailed tables and establishments for the train of all staffs and of all independent units. There are special regulations for the Divisional train; and there are appended to them also detailed tables and establishments for the train of all infantry and cavalry Divisions and of rifle brigades.

⁴ The dead weight of each vehicle is thus calculated :—(1.) The weight of the

	Useful weight.	Dead weight.	Weight of system.
	cwts.	cwts.	cwts.
1. For a two-wheeled cart.....	4½	6½	10½
2. For a two-horsed wagon, pattern 1884 —			
(a.) For cavalry and horse artillery	7 to 7½	10½	17½ to 18½
(b.) For other corps	8½ to 9	10½	19½ to 19½

For well-grown, well-fed, and fresh horses doing harness work in peacetime, this limit of weight may seem to be extremely moderate. But it has been made a *sine quâ non*, because of (1) the want of strength of the majority of the horses which are handed over for the transport service upon the horse conscription, (2) the wear and tear of the service in the transport caused by the irregular times at which the horses are fed, the insufficiency of their food, the injury done to the roads, and the other general severe conditions of warfare. Without a very strict attention to the conditions of the limit of weight, no organization will make the transport mobile.

But even when these conditions are observed, the mobility of the train will not be ensured unless the horses are sufficiently fed. Hitherto our train horses have received the smallest ration (8½ lbs. oats and 18 lbs. hay), although their work is very severe, and though in order to bring them up in condition they require abundant feeding. Accordingly, in addition to improving the construction of the vehicles, and in addition to lessening the weight carried in them, it was considered necessary to increase the ration of the train horses from 8½ lbs. of oats to 13½ lbs., at the same time diminishing the quantity of hay from 18 lbs. to 13½ lbs. per day.

Four-horsed and three-horsed vehicles are not admitted in the regimental train as they are exceedingly cumbersome and heavy. But there are the following exceptions to this rule:—(1) Hospital conveyances (*linéika*) in all arms of the Service; (2) Battery wagons of a special type, one per battery; and (3) Vehicles of the engineer train which—with the object of combining, in the most advantageous possible manner, mobility and capacity, and also with a view to diminishing their number—are drawn partly by teams of four horses, and partly by three-horse teams. These exceptions were determined on beforehand by the special departments, and were thus adopted by the Committee for the organization of the train.

To ensure the correct performance of the duties and for the maintenance of strict discipline, responsible Commanding Officers are appointed to the train of each independent unit as a whole, each section also being under a responsible head; the sphere of the duties and responsibilities of each being

vehicle itself with all its appurtenances, and the tarpaulin. (2.) Oats for three days, at the rate of 13½ lbs. per horse per day, and hay for two days, at 13½ lbs. per horse per day, for the draught horses. (3.) Spare shoes and nails, and horse gear. (4.) Weight of driver and of his kit (180 lbs., including 27 lbs. for kit). In addition to the above the general dead weight of the train of each independent unit, consisting of spare wheels, poles, naves, swingletrees, according to the particular scale, and the picketing gear. This general dead weight is placed upon those vehicles which are not loaded up to the normal limit. Its weight is different for the different units, depending upon the total number of the vehicles. Thus, for instance, in an infantry regiment it is nearly 14½ cwt., in a cavalry regiment 8½ cwt., in a rifle battalion about 5½ cwt. Compared with the former state of affairs, the quantity of spare articles has been diminished by nearly one-half.

accurately defined. In order to develop the training in peace, a programme of instruction for the rank and file of the train has been drawn up, and a system of inspection has been established; exercises in the train service, to be practised at the summer manoeuvres, have also been sketched out.

The order of march, the method of bivouacking and of taking up quarters, the disposal and duties of the train during action, have all been accurately defined by special instructions. The train is divided into two categories¹ for purposes of movement when in the proximity of the enemy.

Before setting forth the details of the organization of our regimental train, it is to be noted that important divergencies from the general principles have been permitted in the case of the engineer troops. They have no brigade (corresponding to the Divisional) train whatever; in their battalion (or park) train they carry everything which, in other branches of the Service, is distributed between the regimental and Divisional trains. This exception is caused by the peculiarities of the engineer service: as it is found that the engineer troops are frequently, and for long periods (sometimes for the whole campaign), split up into small fractions, and are scattered over the whole theatre of war. While securing the supply of the engineer troops in such cases, these exceptions are by no means a hindrance to the mobility of the train; for the commanders of corps, of Divisions, of independent columns, or of detachments have the power, in case of necessity, to detach from the engineer train, and to attach to the Divisional train, those vehicles which contain such stores as are carried in the Divisional train in other branches of the Service.

Nature of Stores Carried in the Regimental Train.

The following are to be carried in the regimental train:—(1) Small-arm ammunition; (2) Provisions; (3) Camp kettles, cooking vessels and appliances; (4) Officers' baggage; (5) Treasury; (6) Office stores; (7) Church stores; (8) Medical stores for giving first aid to sick and wounded and for the establishment of dressing stations; (9) Veterinary stores; (10) Tools and materials for shoeing horses, for repair of arms, of boots, of vehicles, and of harness; (11) Spare stores and train appliances.

In the special branches of the Service there are carried in addition—

In the Artillery.—Artillery stores, spare stores and tools, and one-and-a-half day's rations of oats for the gun, ammunition wagon, and riding horses.

In the Engineers.—Intrenching and other tools, appliances for constructing passages of rivers, and for mines, telegraph stores, &c.

In the Cavalry.—(1) Appliances, (a) for pack transport, (b) for swimming across rivers (bladders); (2) Pack-saddles with tools and materials, (a) for destroying railways and telegraphs, (b) for constructing bridges and ferries; (3) Intrenching tools.

(1) *Small-arm Ammunition.*—The number of rounds to be carried for each armed man in the ranks is laid down at 48 in the infantry, 36 in the cavalry, and 23 in the engineers. The ammunition will be carried in special two-wheeled carts, the number of which is calculated at two per company² in the infantry, and at one per company or squadron in the engineers or cavalry respectively. In the infantry half of the small-arm ammunition carts, and in the other troops all the carts, belong to the company or squadron train; the remaining half of the carts in the infantry form part of the general regimental (or battalion) reserve.

¹ Hitherto the regimental train has been divided into three categories. Now that a Divisional train has been formed it will form the third category.

² With regard to infantry regiments this is not quite correct, as there are 33 two-wheeled carts in all, that is 2 per company and 1 additional.

(2.) *Provisions.*—The regulation quantity to be carried is as follows :—

	Infantry and field artillery.	Cavalry and horse artillery.	Engineer troops.
1. Biscuits, at 1·8 lbs. per man per day.	for 1½ days. ¹	for 2½ days.	for 5½ days. ¹
2. Groats, at 4·8 oz. per man per day...	" 3 "	" 2 "	" 6 "
3. Salt :			
(a.) For cooking, at 0·9 oz. per man per day	" 4 "	" 4 "	" 8 "
(b.) For eating, at 0·75 oz. per man per day	" 2 "	" 2 "	" 4 "
4. Tea, at 0·225 oz. per man per day ...	" 4 "	" 2 "	" 8 "
5. Sugar, at 0·45 oz. " " ...	" 4 "	" 2 "	" 8 "
6. Preserved provisions	nil	" 1 "	nil
7. Various eatables, at the discretion of the Officer commanding; weight per company or battery not to exceed	72 lbs.	..	81 lbs.

Beef is not to be carried, as this is only possible in cold weather; otherwise it gets fly-blown and goes bad very quickly. Thus it is not worth while to maintain *special vehicles* in case of its being possible to carry beef; this would increase the train and the expense of maintaining it, and consequently the cost of the beef also. It is much more practical to allow a reserve of live store cattle to be with the troops in such numbers as circumstances render possible or advantageous. Driving live cattle costs nothing; the cattle can always arrive in time at the bivouac, and ordinarily the length of the column is not increased thereby, as they are driven alongside of the roads.

But cavalry and horse artillery, from the character of their operations and the rapidity of their movements, can hardly reckon on being able often to have live cattle with them. Accordingly, one day's rations of preserved provisions is laid down for them.

The whole quantity of the supplies of provisions is calculated by weight for the number of men on the establishment, taking into account the weight of bags and simple packing material. The provisions are packed in the company, squadron, or battery vehicles. In the general regimental vehicles, provisions are only carried for the rank and file of the regimental staff.

All Officers are allowed in war a free regulation soldier's ration of biscuit, groats, and salt.

(3.) Camp kettles, cooking vessels, and utensils for cooking hot meals are thus carried; in the infantry, field artillery, and engineers, large camp kettles at the rate of three per company and battery; in the cavalry and horse artillery section kettles of a lighter pattern at the rate of four per squadron or battery. The most necessary cooking appliances are carried with the camp kettles. All this weighs rather more than 2½ cwt. per company and field

¹ This includes half a day (*i.e.*, 0·9 lb. per man) out of the 3 days of reserve provisions which the man carries, and which it has been decided to reduce to 2½ days, so as to lessen the weight carried by the soldier. This is the case only in the infantry and engineers; it does not apply to the whole of the artillery or to the cavalry.

battery, and nearly 1 cwt. per squadron and horse artillery battery. One additional pair-horsed vehicle is required for each battalion and for each cavalry regiment specially for the transport of the camp kettles, cooking vessels and utensils, if these are to be carried together.

Thus of course it would be very advantageous and would diminish the train if there were no large pattern camp kettles, and if we could do with the small kettles only, as they do in foreign armies. But on mature consideration it was decided that it would be premature to renounce the large pattern camp kettles at present, as the troops have become too much accustomed to them. We must gradually root out this habit by training in peace, we must insist upon the rank and file habituating themselves to cooking in the small kettles, and Commanding Officers must be convinced that this is both necessary and possible. At present only solitary voices are lifted up against the large camp kettles, while the mass stands up for them might and main. When the majority of Commanding Officers shall have become convinced, by means of experiments in peace, of the possibility of doing without the large camp kettles, then only will the time come to do away with them in the train.

(4.) *Officers' baggage* is subject to the following limits of weight: Officers below field rank 108 lbs., Field Officers 126 lbs.

The baggage must be in canvas bags and in trunks of the regulation pattern, on Diterich's system, fitted both for transport in the vehicles and on pack saddles. The limit of weight includes a folding bedstead of the ordinary pattern. In addition to the 108 or 126 lbs. for each Officer there is further laid down (a) for every two Field and other Officers one field tent, and (b) for every *infantry* Officer, required to be mounted by regulation, transport for two days' supply of oats and one day's supply of hay for one horse. In the artillery the supply of oats and hay for the Officers' horses is in the general battery reserve, and in the cavalry no forage whatever is carried in the train (but only on the saddle of each mounted man), as it is impossible to carry it for the whole mass of the horses.

Commanding Officers of regiments and other independent units are allowed 3·84 cwt. of baggage, which includes a tent and forage.

A portion of the Officers' baggage is carried in special two-wheeled carts in the train of the 1st line, and in the cavalry and horse artillery on pack saddles on the led riding horses. The greater portion, however, is carried with the Government stores of their companies, squadrons, or batteries in the train of the 2nd line. The baggage of Officers of the regimental staff is in the general regimental train (2nd line). Commanding Officers of artillery brigades and independent battalions have each their own special two-wheeled cart. Officers commanding batteries have no special two-wheeled carts, but in the matter of baggage they are placed on the same footing as Officers commanding regiments, being allowed 3·84 cwt.

(5.) *Treasury*.—The weight of the treasury and its chest is fixed according to the amount of money required for the interior economy of the body, viz. :—

	Total weight with chest.	Weight of money.
For an infantry regiment	3½ cwt.	2½ to 3 cwt.
For an independent battalion...	2 " "	1½ to 1½ "
For a cavalry regiment	2½ " "	1½ to 2 " "
For a battery	1½ " "	1 " "

The hundredweight includes about 39,062 roubles in gold and 2,344 roubles in silver. Hence it may be concluded that the above normal limit is sufficient even when the whole of the treasury is in hard cash. The chest for the treasury will be of a new pattern, fitting closely into the body of the vehicle.

(6.) The field office comprises the most necessary regulations, orders, books,

documents, and correspondence connected with the combatant and non-combatant branches, maps of the theatre of war, office appliances, folding furniture, and office tent. Where there are bands the music is carried. All documents, &c., required on a campaign are set forth in the table attached to the general order. Nothing else is taken on a campaign, as the system of correspondence and accounts will be much simplified in war time. Company or squadron offices are never to be taken on a campaign: the Officer commanding should have with him only two documents, viz.: (1) A general cash book of any form he pleases, and (2) a nominal roll in which he will enter all casualties.

In consequence of this simplification of correspondence and accounts on a campaign the weight of the field office is limited—

For an infantry regiment.....	to 3½	cwt.
For an independent battalion	to 2½—2¾	„
For a cavalry regiment.....	to 3½	„
For a battery	to 1½	„

This weight includes the weight of the chest of a new pattern, which also will fit closely into the body of the vehicle, and which is divided by a partition into two compartments. In one of these compartments are the correspondence of the combatant branch and the music, and in the other are the correspondence of the non-combatant branch and the office appliances. Each compartment can be opened and closed separately, and that too without taking the box out of the vehicle.

(7.) Church stores are limited to those which are most required for the performance of religious services in the field (thanksgivings, sacrament, and funerals). The limit of weight is 1 cwt., including the weight of the chest. Where there is no priest on the establishment, only the regimental *ikon* is carried. Companies, squadrons, and batteries may have their own *ikons*, but they must not be more than 9 lbs. in weight, and must be of folding form.

(8.) *The medical stores of each body of troops consists of—*

- (a.) A field pharmacy.
- (b.) Appliances for dressings.
- (c.) Surgical instruments.
- (d.) Everything requisite for the formation of a receiving lazaret of 16 beds in an infantry regiment, of 6 beds in a cavalry regiment and in an artillery brigade, and of 4 beds in an independent battalion.
- (e.) Stretchers at the rate of 2 per company, squadron, or battery.
- (f.) Medical comforts for sick and wounded.

Detailed catalogues of the field pharmacy and of the medical stores were drawn up by the Committee in 1882, and were included in the first edition; but, on the question being further worked out, they were excluded as the Chief Military Medical Administration and the Chief Committee on Military Hospitals did not agree with the proposals of the Committee, and took upon themselves the compilation of the catalogues.

The stores of the hospital dressers are carried together with the medical stores. Special pharmacy two-wheeled carts are detailed for the transport of the medical stores, as well as hospital wagons or two-wheeled carts. The sick and wounded are transported in special hospital conveyances (*linéika*).

(9.) *Veterinary Stores.*—Horse medicines, drugs, vessels, stores, and veterinary instruments are carried in a special chest for each unit. The quantity is calculated approximately at a three months' proportion for 2 per cent. of the establishment of horses. In the cavalry the veterinary pharmacy chest will be carried in a special two-wheeled cart; in other units it will be carried

together with the general regimental stores. Its greatest weight, in a cavalry regiment, is about $3\frac{3}{4}$ cwt.; its least weight, in a rifle battalion, is about $\frac{3}{4}$ cwt.

(10.) *Tools and Materials.*—For infantry there are carried in the train—

- (1.) Blacksmiths' tools, with field forge, and materials for smiths' work, and for repairs to the train.
- (2.) Carpenters' tools.
- (3.) Collarmakers' tools and materials for the repair of harness.
- (4.) Armourers' tools and materials for the armourer's shop, and spare parts of rifles and revolvers.
- (5.) Sickles and scythes.

For cavalry, in addition to the above.

- (6.) Saddlers' tools.
- (7.) Reserve of shoes and nails for horses in the ranks.

For artillery and engineers, in addition to above, their own special tools and materials.

With the aid of all these tools and materials, each unit is able to maintain its train, horses, and arms (and in the special services all their matériel) in constant and perfect fitness. The special reserve of horse-shoes and nails in the cavalry (at the rate of two shoes for the fore feet and 0·45 lb. of nails for each combatant horse) independently of the field forges, is considered indispensable to ensure the shoeing of the horses.

In the infantry, field artillery, and engineers there is carried besides a reserve of tools and materials for the repair of boots, reckoning for four shoemakers per company and battery ($\frac{3}{4}$ cwt.). In the cavalry and horse artillery there are none of these articles, as their boots last much longer owing to the nature of their service. The reserve of ready-made boots is all in the Divisional train.

(11.) *Reserve stores and appliances for the train*, independently of those which form the dead weight of each vehicle, are carried so as to avoid delay in exchanging damaged or broken parts. These consist of swingletrees, naves, poles, axles, wheels, and also picketing gear. The quantity of articles of each sort is fixed proportionately to the number of horses and vehicles in the train of each unit. Thus, for instance, the quantity of picketing gear is calculated at one heavy picket for every five horses, and at $3\frac{1}{2}$ feet of rope for every horse. In the cavalry (regular only) picketing gear is carried not only for the draught horses but also for all combatant horses, as there have been instances where the horses in a panic have broken away from the light pickets. Spare harness (collars and breeching) for half the number of reserve horses of each unit are carried on the horses themselves.

(12.) *Articles carried only in the Train of the Cavalry.*—In the cavalry there are carried in addition—

- (a.) Pack saddle fittings, four pairs per squadron and regimental staff. By means of these, each squadron can at once transfer to pack-saddle transport 5 cwt. of gear, that is $1\frac{1}{4}$ cwt. per pack saddle, and a whole cavalry regiment can so transport 35 cwt. The Commanding Officer of the regiments details the baggage to be placed on the pack saddles.¹
- (b.) Appliances for swimming across rivers (bladders, six pairs per squadron).
- (c.) Tools for destroying railways and telegraphs on pack saddles, one per squadron.

¹ In other branches of the Service pack-saddle fittings are carried in the Divisional train.

- (d.) Tools for constructing bridges and ferries, one set for each squadron.
- (e.) Intrenching tools, four shovels and four axes per squadron.
- (f.) Supply of pyroxiline.

All the articles from *c* to *f* are carried together in a special two-wheeled cart. In case of necessity, the pack saddles with the tools for the destruction of the railways and telegraphs are put upon the spare horses.

Distribution of Stores between the Company, Squadron, and Battery Trains, and the actual Regimental Train.

In explaining the general principles of the organization of the train, it has been stated that all stores are divided into company, squadron, or battery, and general regimental stores, and that the packing and also the number of vehicles is so arranged that when each portion of the regiment becomes detached, its corresponding train can be detached with it.

To carry out this fundamental condition, the stores carried in the regimental train are thus distributed :—

A. In the Infantry.

- (1.) In the *company train* of each company are carried :—
 - (a.) Nearly half the small-arm ammunition (at the rate of twenty-three rounds per man) in a special two-wheeled cart.
 - (b.) The whole supply of provisions.
 - (c.) Camp kettles and cooking appliances.
 - (d.) Reserve of materials and tools for repair of boots.
 - (e.) Scythes and sickles.
 - (f.) Officers' baggage.
 - (g.) Stores of the company hospital dresser.

All these (from *b* to *g*) are packed in two pair-horsed wagons. As the total weight of all the stores does not reach the limit of weight laid down, the spare room is used up for the baggage of Officers commanding battalions, Adjutants, Surgeons, and for certain general reserve stores and appliances for the train.

Consequently the train of each company consists of one small-arm ammunition cart, and two pair-horsed wagons.

(2.) The regimental train carries all the other stores, the small-arm ammunition and field pharmacy in special two-wheeled carts, the medical stores in a special pair-horsed wagon in an infantry regiment, and on a special two-wheeled cart in other independent units. The other impedimenta are carried in pair-horsed wagons. The four-horsed conveyance (*linéika*) for the sick, also belongs to the regimental train.

B. Engineers.

(1.) In the *company train* the same stores are carried as in the infantry, but with the addition of all the engineer train—and besides this *all* the small-arm ammunition is carried and not the half only.

As the supply of provisions in the engineers is much greater than in the infantry (being the regimental and Divisional supply combined), so the company train is also much greater. Thus for instance the composition of the train of each sapper company is as follows :—

Supply train	{ 1 S.A.A. cart.
	{ 1 Officer's cart.
	{ 4 pair-horsed wagons.
Engineer train	{ 1 four-horsed wagon.
	{ 2 three-horsed wagons.
Total.....	9 vehicles.

With these nine vehicles a sapper company can be detached anywhere and for any length of time without being in want of anything.

(2.) The *battalion train* carries all the other stores.

C. Cavalry.

Besides the division of the train into squadron and actual regimental train, there is a further subdivision of the squadron train into first and second line. The squadron vehicles of the first line go always and everywhere with the squadron; those of the second line only accompany the squadron when circumstances permit or require them to do so, when this is not the case they form the general column with the regimental train.

The *squadron train of the first line* consists of:—

S.A.A. carts	} One per squadron.
Squadron pair-horsed wagons	

In the S.A.A. carts there is the whole regulation quantity of small-arm ammunition: in the squadron wagons there are carried a portion of the provisions (biscuits at the rate of 0.9 lb. per man and salt for cooking for two days), all the preserved provisions, camp kettles and appliances, picketing gear, sickles and scythes, pack-saddle fittings, bladders, and Officers' tents (and in Cossack regiments all the Officers' baggage, as there is room for it owing to the absence of picketing gear). The most necessary articles for the Officers (36 lbs. per head) are carried on pack saddles on the led horses.

(2.) In the *squadron train of the second line* (which consists of one pair-horsed wagon per squadron) the remainder of supply of provisions is carried, the field forge with a supply of coal, and the remaining portion of the Officers' baggage. In Cossack regiments there are no vehicles belonging to this line.

(3.) In the *regimental train* everything else is carried.

Thus the *squadron train* consists of—

	S.A.A. carts.	Squadron pair-horsed vehicles.		Total vehicles.
		1st line.	2nd line.	
Regular cavalry	1	1	1	3
Cossack regiments ...	1	1	—	2

D. Artillery.

The organization and division of the train in the artillery is based upon that of the infantry or cavalry.

Composition of Train of a Battery.

		Field.	Horse.
Artillery train	{ 4-horsed wagon	1	1
	{ Pair-horsed wagons	4	4
	{ Pair-horsed wagons	3	4
Supply train	{ Pharmacy cart	—	1
	{ 4-horsed conveyance (<i>linéika</i>)	—	1
	{ for the sick	—	—
		8	11

In the field artillery the pharmacy carts and conveyances (*linéika*) for the sick form part of the train of the brigade staff, *i.e.*, form part, so to speak, of the general regimental train of the whole brigade. In the horse battery there is one wagon more than in the field battery, because the loads have to be lighter. A part of the Officers' baggage in horse batteries is to be on pack saddles as in the cavalry.

Thus the principle of the individuality of the company, squadron, and battery, and of the general regimental stores, is carried out in all arms of the Service. In *gens d'armes* squadrons—which, according to the nature of their service, are nearly always broken up into sections—each section has its own special vehicle.

On the introduction of the new organization and of the vehicles of the new pattern the regimental train will be composed as follows :—

(1.) *Corps Headquarters*.—8 pair-horsed wagons with 19 horses (including 2 spare and 1 riding horse), and 10 trained soldiers. In addition to these there are 2 pair-horsed wagons for the staff of the Officer commanding the artillery of the corps.

(2.) *Headquarters of an infantry Division*.—4 pair-horsed wagons with 10 horses (1 spare and 1 riding) and 4 train soldiers.

(3.) *Infantry regiment*.—33 S.A.A. carts (including 16 company carts), 4 pharmacy carts, 1 cart for Commanding Officer, 5 Officers' carts of the first line (1 per battalion and 1 for regimental headquarters); total, 43 carts. 32 company wagons and 7 regimental wagons (including medical wagon); total, 39 pair-horsed wagons. Four hospital conveyances (*linéika*). Grand total, 86 vehicles, 158 horses (137 draught, 14 reserve, and 7 riding) and 103 rank and file.

(4.) *Staff of a rifle brigade*.—2 pair-horsed wagons.

(5.) *Rifle battalion*.—8 S.A.A. carts (including 4 company carts), 1 pharmacy cart, 1 medical cart, 1 Commanding Officer's cart, 1 Officer's cart of first line, 1 for the treasury and office; total, 13 carts. 11 pair-horsed wagons, one hospital *linéika*. Grand total, 25 vehicles, 45 horses (39 draught, 4 spare, and 2 riding), and 30 rank and file.

(6.) *Headquarters of an artillery brigade*.—2 pharmacy carts, 1 medical cart, 1 for Officer commanding the brigade, 2 for administrative services; total, 6 carts; 3 hospital *linéikas*. Grand total, 12 vehicles, 27 horses (24 draught, 2 spare, 1 riding), and 16 rank and file.

(7.) *Battery* (heavy and light). (a.) Artillery train: one 4-horsed wagon and 4 pair-horsed wagons. (b.) Supply train: 3 pair-horsed wagons. Grand total, 8 vehicles, 21 horses (18 draught, 2 spare, and 1 riding), 10 train soldiers.

Consequently in the *whole artillery brigade* (headquarters and 6 batteries) there are 6 carts, 45 pair-horsed wagons, 9 four-horsed wagons; total, 60 vehicles, 153 horses, and 77 rank and file.

(8.) *Headquarters of cavalry Division*.—6 pair-horsed wagons, including 3 for the conveyance of the clerks and other rank and file at headquarters, so that it can always keep up with the Division; 13 horses, 6 train soldiers.

(9.) *Cavalry regiment*.—6 S.A.A. carts, 1 pharmacy cart, 1 medical cart, 1 veterinary cart, 1 for Officer commanding regiment, and 1 for regimental headquarters; total, 11 carts. Six squadron wagons of first line, 6 of the second line; regimental wagons—14 for various stores, 3 for conveyance of dismounted non-combatants; total, 29. 2 hospital *linéikas*. Grand total, 42 vehicles, 85 horses (including 8 spare), 48 train soldiers. In a Cuirassier regiment (4 squadrons) there are 34 vehicles (viz.: 9 carts, 23 pair-horsed wagons, and 2 hospital *linéikas*), 69 horses (including 6 spare), and 39 train soldiers.

(10.) *Cossack regiment* (of 6 squadrons).—6 S.A.A. carts, 1 pharmacy cart, 1 medical cart, 1 veterinary cart, 1 for Commanding Officer; total 10. 20 pair-horsed wagons, 2 hospital *linéikas*. Grand total, 32 vehicles, 64 horses (6 spare), and 37 train soldiers. In a four-sotnia regiment there are 25 vehicles (8 carts, 15 pair-horsed wagons, and 2 *linéikas*), 51 horses (5 spare), 29 train soldiers.

(11.) *Horse artillery battery*.—(a.) Artillery train: 1 four-horsed wagon, and 4 pair-horsed wagons; (b.) Supply train: 1 pharmacy cart, 4 pair-horsed wagons, and 1 *linéika*. Grand total, 11 vehicles, 28 horses (25 draught 2 spare, 1 riding), 14 train soldiers.

(12.) *Headquarters sapper brigade*.—6 pair-horsed wagons, 52 horses (including 40 of the general horse reserve of the brigade), and 26 train soldiers.

(13.) *Sapper battalion*.—(a.) Engineer train : 8 three-horsed, and 4 four-horsed wagons. (b.) Supply train : 4 S.A.A. carts, 1 pharmacy cart, 1 medical cart, 1 for Commanding Officer, 5 Officers' carts (1 per company and battalion staff); total, 12 carts. 21 pair-horsed wagons, 1 hospital *linéika*. Grand total, 46 vehicles, 114 horses (98 draught, 10 spare, 6 riding), and 61 train soldiers.

(14.) *Pontoon battalion*.—(a.) Pontoon train : 58 fourgons, 372 horses (24 spare), and 144 drivers. (b.) Supply train : 2 S.A.A. carts, 1 pharmacy cart, 1 medical cart, 1 for Commanding Officer; total, 5 carts. 14 pair-horsed wagons, 1 hospital *linéika*; total, 20 vehicles, 14 horses (4 spare), and 24 train soldiers. Grand total train, 78 vehicles, 413 horses, 168 rank and file.

(15.) *Field Telegraph park*.—(a.) Telegraph train : 4 four-horsed station carriages, 24 four-horsed wagons for telegraph stores; total, 28 vehicles, 62 horses¹ (including 4 spare and 2 riding), and 44 train soldiers. (b.) Supply train : 1 cart for Officer commanding park and 14 pair-horsed wagons; total, 15 vehicles, 32 horses (including 3 spare), and 16 train soldiers. Grand total, 43 vehicles, 94 horses, 60 train soldiers.

(16.) *Field Engineer park*.—(a.) Engineer train : 80 pair-horsed wagons, 196 horses (including 20 spare and 16 riding), and 103 train soldiers. (b.) Supply train : 1 cart for Commanding Officer of park, 5 pair-horsed wagons; total, 6 vehicles, 11 horses, and 6 train soldiers. Grand total train, 86 vehicles, 207 horses, 109 train soldiers.

(17.) *Gens d'Armes squadron*.—7 pair-horsed wagons (1 per section, and 2 general), but in the guard squadron 1 cart and 5 pair-horsed wagons (1 per section and 1 general). The commander and Officers are granted allowance for the purchase of their own single-horse vehicles, harness, and horses, 1 for each Officer, and they are granted forage allowance. In return they are bound to carry in their vehicles the kits and supplies for the gens d'armes who are attached to them when on detached duties.

Private train is only allowed to the higher Commanding Officers, commencing with Officers commanding independent bodies of troops, according to the scale laid down in a special table. This table will be appended to the Regulations for Allowances in Time of War, which is now being drawn up afresh to replace the regulations in 1876.

Division of Regimental Train into Lines.

When marching in proximity to the enemy, the regimental train is divided into two lines; the 1st always follows after its own unit, and the 2nd is detached to the rear of the whole marching column.

The 1st line is made up so as to ensure the supply of the most pressing requirements of the troops. It comprises—

(a.) Half the company S.A.A. carts in the infantry, and all the S.A.A. carts in the cavalry and engineers. The supply of ammunition for each man on the establishment is thus :—12 rounds in the infantry, 36 in the cavalry, and 23 in the engineers. But as the establishment will never be complete, it may be reckoned that there will be at least 16 rounds per man in the infantry, 40 in the cavalry, and 25 in the engineers; that is, together with the supply carried on the person, there will be 100 rounds per man in the infantry, 76 in the cavalry, and 85 in the engineers. This is enough for a very obstinate fight, all the more so as, if there is the prospect of such a struggle, the Commander of the force may increase the number of S.A.A. carts of the first line for the infantry.

¹ This is so in the original : therefore either the number of horses is too small, or the wagons are only pair-horsed.—T.B.

(b.) *All the hospital train, i.e., all the pharmacy carts, medical wagons (or carts), and hospital linéikas.* These will be most of all in an infantry regiment, viz., nine vehicles. This is a large number, but they are indispensable for giving aid to the sick on the march, and to the wounded on the field of battle.

(c.) *A portion of the Officers' baggage, viz.:*—In the infantry, engineers, and field artillery, for the regimental (or brigade) Commander all his baggage ($3\frac{1}{2}$ cwt.) in a special two-wheeled cart, for the other Officers $15\frac{1}{2}$ lbs. baggage each, in canvas bags, a portion of the field tents, and part of the forage for the horses. All this—for infantry in the special two-wheeled carts, one for headquarters and for each battalion—for artillery in a four-horsed wagon of the artillery train, which will always be in the 1st line.

In the cavalry and horse artillery 36 lbs. for each Officer, on pack saddles on the led riding horses.

The 2nd line comprises all the remaining vehicles. The engineer train is detailed for the 1st or 2nd line, according to circumstances, at the discretion of the commander of the force.

When the train is divided, the 1st line follows after its own units under the command of the Officer in charge of the arms, while the 2nd line, belonging to each unit, remains under the command of its regular commander, and forms a general train column, the head of which is 500 paces from rear of the main body. This distance in the sphere of probable conflict with the enemy may be increased to $5\frac{1}{2}$ miles, but not more; otherwise the train will not arrive at the halting-place in sufficient time.

For facility of reference, the following tables give the train of each of the principal units, with the line to which the different vehicles belong, and the depth of column:—

1. Infantry Regiment.

	Vehicles.	Horses (exclusive of riding).	Depth of column in paces. ¹
1st Line.			
1st echelon of Company S.A.A. carts	8	8	36
Pharmacy carts.....	4	4	18
Medical wagon	1	2	12
Hospital linéikas	4	16	48
Officers' carts (1 for C.O., 1 for regimental H.Q., and 1 per battalion)....	6	6	27
Spare horses	—	4	6
Total 1st line.....	23	40	147
2nd Line.			
2nd echelon of Company S.A.A. carts	8	8	36
Regimental S.A.A. carts	17	17	77
Company pair-horsed wagons.....	32	64	384
Regimental train	6	12	72
Remainder of spare horses	—	10	15
Total 2nd line	63	111	584
Total infantry regiment	86	151	731

¹ The basis of calculation is as follows:—Carts go two abreast, and cover a depth of 9 paces; pair-horsed and 4-horsed wagons, in single file, occupy 12 paces. In order to allow for opening out on the march 3 paces are added for each vehicle.

4. Cossack Regiment (Six *Sotnias*).

	Vehicles.	Horses (exclusive of riding).	Depth of column in paces.
1st Line.			
S.A.A. carts	6	6	27
Pharmacy and medical carts	2	2	9
Hospital <i>linéikas</i>	2	8	24
Squadron vehicles of 1st line	6	12	72
Led Officers' horses	—	22	33
Grooms with them ¹	—	11	
Total 1st line.....	16	61	165
2nd Line.			
Regimental train—pair-horsed wagons	14	28	168
" " carts for the C.O. and veteri- nary stores.....	2	2	9
Spare horses	—	6	9
Total in 2nd line	16	36	186
Total Cossack regiment	32	97	351

5. Battery of Horse Artillery.

	Vehicles.	Horses (exclusive of riding).	Depth of column in paces.
1st Line.			
Pharmacy cart	1	1	9
Hospital <i>linéika</i>	1	4	12
Artillery train—special pattern wagon	1	4	12
Led Officers' riding horses, 1 per Officer and official on establishment	—	7	11
Grooms for above, 1 man per pair of Officers' horses.....	—	4	
Total 1st line.....	3	20	44
2nd Line.			
Artillery train—pair-horsed wagons	4	8	48
Supply " " "	4	8	48
Spare horses	—	2	3
Total 2nd line	8	18	99
Total battery horse artillery..	11	38	143

¹ At the same rate as in a cavalry regiment, but the number of Officers on the establishment is less.

charge of the train and its sections, so that they may be able really to control the train and to maintain the strictest order in it.

If the 1st section is detached the Officer in charge of the arms takes command of it. As the warlike stores are in his charge, it is most natural that he should command this portion of the train. If the troops come into action he is bound to organize and maintain a regular supply of ammunition. The hospital train and the Officers' carts, or pack-animals of the 1st line, remain in his charge only until the dressing station has been set up; after this has been done they pass under the orders of the senior surgeon. It is considered more convenient to concentrate the Officers' carts, or pack-animals, with their servants, during the action at the dressing station, because, if an Officer is wounded, his kit and servant are then at hand. The servants can make themselves generally useful at the dressing station, while at all other points of the field they will only be in the way.

The regular commander of the train, when it is split up, always remains with the 2nd line, as this forms the greater portion; and besides, on account of the distance which separates it from the troops, it is more necessary to have with it a commander whom the men know, and who knows them.

Duties and Powers of the Personnel of the Train.

The duties and powers of the personnel of the train have hitherto not been accurately and fully laid down anywhere. Now this omission is rectified. All the duties of the commander of the train for each independent unit are accurately defined, and he is given the powers of a company commander if he is an Officer, of a sergeant if he is of lower rank. All ranks marching with the train, although they may not be under the command of the commander, are obliged to carry out his orders. No one except the commander may dare to give orders regarding the train, and the commander takes orders only from the Officer charged with the interior economy of the corps, or from the commander of the unit himself. The duties of the commander of each train-section are accurately laid down, and he has the powers of a sectional non-commissioned officer. Finally, a detailed list of the duties of each train soldier has been made out. All the details of service in the train are laid down in the special instructions, which consist of three main divisions, viz.:—(1) Order of march; (2) Order of bivouacking or billeting; (3) Disposal and duties of the train during action. The train is to be guided by these instructions in peace time as well.

II. Divisional Train.

The Divisional train is laid down in war time for each infantry and cavalry Division (a rifle brigade has a brigade train). Its object is threefold: (1) Unity of administration of all transport composing the general impedimenta of the whole Division, as well as of the transport which is detached from the regiment to form part of the general Divisional column; (2) The uninterrupted and systematic maintenance of a reserve for the regimental train; (3) The organization of a connecting link between the regimental train and the nearest stores and magazines.

Hitherto the transport temporarily relegated to the general train of the Division (such, for instance, as regimental wagons with the four days' reserve of provisions) had no regular system of administration, and that which belonged, or was attached temporarily to the whole Division (as, for instance, the Divisional hospitals, artillery parks, sections of engineer parks) had no general commander. Accordingly there was no unity or agreement in the train, and consequently there was no order.

Strictly speaking the normal basis of the Divisional train should be its complete individuality, independent cadres in peace, special training, separate

stores, special establishments and tables. But as the formation of a special category of train troops would be very expensive, and would increase the military budget, an organization has been worked out which gives rise to the least expenditure in peace, and which at the same time is sufficiently well suited to a rapid transition to the war footing.

In peace there are neither separate cadres, nor separate stores. All the articles carried in the Divisional train are to be kept with the regiments and artillery brigades, and only a very small portion will be in charge of the district intendants' administrations. The personnel—Officers and officials—is appointed beforehand by the commander of the Division from those under his command, whether on the active or reserve lists, provided that they are well known to the Divisional Commander as trustworthy persons. The rank and file are detailed in the lists of the headquarter staff.

The Divisional train consists of a commander and three permanent sections: (1) The general; (2) The supply; and (3) The sanitary sections. In addition to this there may be two more temporary sections: (4) The artillery section—consisting of the artillery parks, which may be attached to the Divisions (ordinarily the parks form part of the whole army corps); and (5) The engineer section, in case of a section of a field engineer park, or of a telegraph park being attached to a Division. The last three sections forming a part of the Divisional train, are completely organized according to their own special regulations, and are under the orders of the commander of the Divisional train only as regards discipline on the march and at the halt, and also as regards quarters and marches. The first two sections (the general and the supply), which have received a new organization by the present regulations, are placed under the orders of the commander of the Divisional train in all respects.

The composition of the sections is as follows:—

(1.) *General Section.*—(a) Vehicles of the staff of the Divisional train; (b) Vehicles of all the troops composing the Division, detached from the regimental train either permanently or temporarily (with the exception of the vehicles with provisions); and (c) The special horse reserve for the immediate supply to meet losses of draught and of artillery horses.

(a.) The vehicles of the staff of the Divisional train and of the general section carry, for the use of the personnel, the same stores, in the same quantity, as are carried in the regimental train, *i.e.*, supplies, kettles and appliances, Officers' baggage, &c.

(b.) The regimental vehicles, which form part of the permanent portion of the Divisional train, carry all those stores belonging to the separate units which there is no immediate necessity to have in the regimental train, *viz.*, the field church, intrenching tools, reserve of boots (thirty-two pairs per company and battery), reserve of made-up clothing (four sets per company and battery), with materials for their renewal and repair, pack-saddle gear (the number of pack-saddles is equal to the number of pair-horsed vehicles of each separate unit), and a reserve of horse-shoes and nails for the number of horses on the establishment (at the rate of two fore-shoes and $\frac{1}{2}$ -lb. nails per horse).

(c.) The horse reserve is calculated at about 3 per cent. of the total number of artillery and draught horses in the Division.

The composition of the general section is of the same nature for infantry Divisions and for rifle brigades. In cavalry Divisions there is this difference, that there are no intrenching tools and pack-saddle gear (for they are both in the regimental train) and there are no materials for the renewal and repair of clothing, inasmuch as cavalry has no time for this.

For Cossack regiments and batteries only a reserve of shoes and nails is carried, as the representatives of Cossack troops considered a reserve of boots and clothing unnecessary.

The field church is only in the general section of the train of an infantry Division.

If it should be necessary to diminish the dimensions of the regimental train, all the vehicles which are temporarily detached by it should also form part of the general section of the Divisional train, with the exception of the vehicles with provisions and kettles, which are attached to the supply section. But if it is necessary to march without any train, the regimental train remains in rear as an organized body, either independently of the Divisional train, or forms part of it for a time, as is most convenient. In both cases order is assured.

(2.) *The Supply Section* consists—for infantry Divisions and rifle brigades—of two sets of transport—the expense, and the reserve: for cavalry Divisions of one set—the expense. The expense transport carries a four days' reserve of biscuits and groats, eight days' salt, and ten days' tea and sugar for the establishment of the whole Division. The reserve transport carries a similar quantity, and serves to feed the expense transport with supplies from the nearest magazines, and forms a reserve of means of transport for the Division in general. No reserve transport is laid down for a cavalry Division, because, from the nature of its service, it cannot be fed by transport, but must subsist on the means of the country. Reserve transport is also not laid down unconditionally for infantry Divisions and rifle brigades. If from the character of the operations, or from the conditions of the theatre of war, all or some Divisions can do without train, reserve transport is not supplied to them, but it forms a portion of the transport of the army: i.e., a general reserve of its means of transport.

(3.) *The Sanitary section* exists only in infantry Divisions, and consists of a Divisional lazaret, which serves to give aid to the sick on the march, and to the wounded on the battle-field (for the formation of the dressing station), and of two Divisional hospitals, each of 200 beds, which can be opened for the treatment of the sick and wounded, wherever required. Each of these mobile medical establishments forms an administrative unit: the administration of all three is united in the person of the Divisional surgeon, but in all matters relating to allotment of quarters, marching, and discipline on the march, all the medical establishments are under the orders of the Commander of the Divisional train. It has already been stated above that the commanders of artillery park brigades and of field engineer and telegraph parks have the same relations towards him, if these bodies are temporarily attached to the Division.

Speaking in general terms the command and supervision is concentrated in the person of the commander of the Divisional train, but the immediate control of the portions of the train and the supervision of their interior economy is the duty of the commanders of the various sections. A complete centralization of all the branches of administration of the Divisional train in all its parts and in all its relations would be impracticable: the commander of the Divisional train would be quite powerless to deal with so large, so complicated, and so varied a system of economy, which would in addition have to be carried out under exceedingly difficult circumstances.

Accordingly it was deemed more practical to grant the commanders of sections of the Divisional train the powers of Officers commanding independent units, with all the resultant responsibilities and duties. But the Commander of the whole Divisional train, while exercising a general superintendence over the whole service of the train, is only obliged to carry out a general supervision in matters of interior economy, which are in the hands of his subordinates. This obligation is rendered the more easy by his not being personally interested in the interior economy of the train.

The organization of the separate portions of the Divisional train and the method of control must now be considered.

This organization is based upon the same principle of the individual supply of each independent unit (of convenience in dividing the Divisional

train in case the parts of the Division are separated), as held good in the case of the organization of the regimental train. In the case of the regimental train it was taken as a rule that each company, squadron, or battery should have its own vehicles; here special vehicles are allotted to each regiment (or rifle battalion), artillery brigade, and horse battery, both in the general section, and in the expense and reserve transports. In the train of an infantry Division, on account of the large number of vehicles, the vehicles of each regiment and artillery brigade form a special subdivision both in the general section and in each transport. The vehicles forming the special train of the section or transport, as well as those in which the reserves of all sorts for the Divisional train and for the Divisional Staff are carried, are grouped into a special subdivision. Thus, the general section, and the expense and reserve transports of the train of an infantry Division, are each divided into six subdivisions. The first four belong to the corresponding regiments, the 5th to the artillery brigade, and the 6th belongs specially to the Divisional train and to the Divisional Staff. In the general section the horse reserve forms part of the 6th subdivision. The subdivisions of the general section are commanded by non-commissioned officers. In the expense and reserve transports the subdivisions are so large that it is deemed necessary to group each pair of subdivisions (1st and 2nd, 3rd and 4th, 5th and 6th) under the command of an Officer, who has the powers of a company commander.

Thus, the commanders of the general section and of the expense and reserve transports in the train of infantry and cavalry Divisions are guided in the exercise of their functions by the regulations for the administration of a regiment, while the commanders of each pair of subdivisions of the expense and reserve transports are guided by the regulations for the economy of a company. In the train of a rifle brigade, on account of its numerical inferiority, the commander of the whole train enjoys the powers of a commander of an independent unit in all respects, and, at the same time, superintends the general section as well—while each transport of the supply section is in charge of an Officer with the powers of a company commander.

This organization gives the power, in case regiments or batteries are detached from a Division (or in case a rifle brigade is broken up), of detaching with the troops the corresponding portions of the train.

Example 1. The 3rd infantry regiment of a Division with two batteries are detached to form a special force. At the same time the train detaches the 3rd subdivisions of the general section of the expense and reserve transports, in their entirety, and the number of vehicles corresponding to the two batteries from the 5th subdivision. The Commander of the non-combatant company of 3rd infantry regiment takes the general command over the whole of the train so detached.

Example 2. A special force is formed of a brigade of cavalry with a horse artillery battery. The Divisional train detaches the corresponding special vehicles from the general section and from the expense transport, and they are attached to the regimental train of the 2nd line.¹

Example 3. A special force is formed of two infantry regiments of different Divisions, of a rifle brigade, of three field batteries of different brigades, and of a Cossack regiment. The Divisional (and brigade) transport detaches the corresponding subdivisions and special vehicles of the general section, of the expense and reserve transports, and they are concentrated in a train for the force. The senior subdivisional commander takes command, or a special Officer may be appointed to the command of the train. If there is no necessity for the force to divide its whole train into three lines, the portions which have been detached from the Divisional train may be united with the corre-

¹ The men and horses, with the vehicles of each regiment and battery, are attached for rations to the troops to which they correspond.

sponding regimental train of the second line, and a general commander of the whole train column need only be appointed.

In one word, the organization is so pliant that it is possible to form all sorts of combinations as may be found most convenient.

If it is not necessary to attach to the force detached all the corresponding portions of the Divisional train, it is only requisite to order what portion is to be detached and what is to remain behind. The organization is thereby in no way thrown out.

When a detached force is broken up, the sections and vehicles which were attached to it are likewise broken up and return to the portions of the train to which they regularly belong.

We will now explain the method of keeping the stores, mobilization, the duties of the divisional train, and the rules for its disbandment.

It has already been stated that the Commander of the whole train and the Officers of the general and supply sections are nominated in peace-time by the Divisional Commander. The officials of the sanitary section are appointed in accordance with the regulations for the medical establishments. All the material is kept by subdivisions, with the corresponding bodies of troops. The stores of the 6th subdivisions (for the Divisional staff and Divisional train) is kept at special points, selected by the Chief Intendance Department.

On mobilization being ordered, the subdivisions (or separate vehicles) are put on the war footing by the troops to which they correspond, at the points at which the stores are kept, and are then sent off to the points of concentration. The rank and file of horses are despatched to the place of mobilization according to the lists kept by the Headquarter Staff, and the Officers according to the orders of the Divisional Commanders. The commander and all Officers are appointed in army corps orders; they retain their uniform, and during the whole of the war they are shown as being "on command;" but when the train is broken up, they return to their regiments. Thus the train service is performed by no temporary outsiders, taken here, there, and everywhere, or from the retired list, for the time of the war, but is entrusted to Officers belonging to the corps, who are known to the authorities and to their comrades, and who feel secure as to their fate on the termination of the campaign. If any Officer is found unfit for the train service, the Officer commanding the corps of his own authority can remove him, and can appoint another Officer recommended by the Divisional Commander.

As the portions of the Divisional train arrive at the point of concentration, the commander of the Divisional train inspects them in detail, and then the whole train is inspected by the Officer commanding the Division, and takes the field with it.

The method of supplying the regimental trains from the Divisional train is settled by the Divisional Commander himself in accordance with circumstances. He orders the troops either to send their demands through the Divisional staff, or straight to the Commander of the Divisional train. It is only necessary that the method of supply which the Divisional Commander prescribes (and any subsequent alterations) should be promulgated in Divisional orders, and not verbally. The staff of the Division is obliged to (a) make known to the troops the distribution of the Divisional train, and (b) to despatch in sufficient time to the commander of the Divisional train all routes, dispositions, and other written orders relating to movements or to possible actions. If these rules are accurately observed, it may be regarded as certain that the transport service will be accurately performed.

All formalities, which might cause loss of time, are forbidden by the regulations as far as possible. If the troops have to draw anything from the Divisional train, in extreme cases the requisition may be made with the signature of any Officer of the regimental staff; and the requisition is to be at once complied with, and it serves as a voucher for the Divisional train.

The issue of the stores required is considered to be entirely vouched for if there is a receipt entered against the issue in the store account.

The method of delivery of stores from the Divisional train to the troops is not laid down beforehand; consequently, the empty vehicles belonging to the troops may either be sent to the Divisional train to be filled, or *vice versa*, as most convenient. It is only required that in the latter case the troops should not detain the vehicles of the Divisional train, and should send them back immediately; the Divisional Commander only is able to alter their destination. If this is done in his name, it must be done in writing.

Supplies issued from the expense transport must be immediately replenished from the reserve transport. The commander of the expense transport is responsible for this: he must, without delay, require the corresponding quantity of stores to be brought from the reserve transport, and the commander of the latter must at once despatch what is wanted. The method of making demands and of vouching for them is the same as that explained above. The reserve transport in its turn is replenished from the nearest magazines, or by other means according to the orders of the Corps Intendant.

The interior economy, correspondence, and accounts of the various parts of the Divisional train are carried out according to the rules and forms laid down for independent units, or in accordance with the regulations for the economy of a company, as the case may be. The only special articles of correspondence and accounts are:—(1) The store account, in which are entered the issues and receipts of stores conveyed for the troops, with the acknowledgments of the recipients against the issues; (2) the route book, which is kept only in the reserve transport. As this transport is always moving between the Divisional train and the nearest magazines, and consequently as it is without the immediate control of the commander of the Divisional train, it is necessary to have some documentary record of its service from day to day, so that it may be clearly seen what it was doing; and if it was delayed, the reason for such delay. So that this can be done, and so that it can be seen from the records, the regulations give exact instructions as to the entries to be made in it. Accuracy in keeping the route book, while enabling the service of the reserve transport to be verified, at the same time protects the commander from undeserved accusations and imputations.

On the conclusion of the war, the Divisional train is only broken up when the troops return to their permanent stations. A special committee, nominated by the Divisional Commander, takes stock of the stores remaining on hand, draws up lists and reports, and gives orders for the stores to be handed over to those troops and magazines which are entrusted with their custody. Moneys remaining over after the stock-taking are handed over to the nearest treasury chests, and receipts are taken for them. The Officers return to their corps, and the rank and file are dismissed to the reserve. The horses are sold or are told off for other duties, according to the orders of the War Minister.

Tables and Establishments of the Divisional Train.

The articles to be carried in the Divisional train were mentioned above. We must now state the number of vehicles and horses of which it should consist.

First, a few general explanations.

(1.) *Vehicles of the Divisional Train.*—As the troops have an immense number of light pair-horsed vehicles of the 1876 pattern, which are eventually to be replaced by wagons and carts of the 1884 pattern, it would be impossible to do away with these vehicles, which are quite serviceable. When the proper limit of weight has been fixed, they may serve quite well for a long time. Accordingly, it has been decided to transfer them from the regimental to the Divisional train, in which they will remain till they become unserviceable; consequently, the Divisional train will still for a long time consist of vehicles

of the 1876 pattern. In view of this, its dimensions are calculated upon the capacity and limit of weight of the vehicles of the 1876 pattern; and the number of horses and men is fixed in accordance with their numbers.

It has also been decided to fit these vehicles for three-horsed draught so as to increase the useful weight, and consequently to diminish the number of vehicles in the Divisional train. The experience of the sapper battalions—(the engineer train consists almost entirely of three-horsed vehicles of the 1876 pattern)—has already proved that this can be done very simply, conveniently, and cheaply. From their construction and capacity, the vehicles of 1876 pattern are able to carry even more than the limit of weight.¹ The Divisional train of a Cavalry Division and the brigade train of a rifle brigade is to be composed of pair-horsed vehicles of the same pattern. This is considered more advantageous on account of the quantity and weight of the baggage.

The limit of weight of the whole system is fixed as follows:—For three-horsed draught at 25 cwt. ($8\frac{1}{2}$ cwt. per horse), and for pair-horsed draught at 21 cwt. ($10\frac{1}{2}$ cwt. per horse). The quantity of useful weight is then: for three-horsed draught, 11·5 cwt.; for pair-horsed, 8 cwt. The limit of weight is somewhat greater than in the regimental train ($1\frac{1}{2}$ cwt. more for a pair-horsed vehicle), as less mobility is required of the Divisional train. But even this limit of weight is much less than formerly: hitherto a loaded wagon of the 1876 pattern, harnessed with two horses, weighed $25\frac{1}{2}$ cwt. in the regimental train; now it will weigh not more than 21 cwt. (or $4\frac{1}{2}$ cwt. less) in the Divisional train. And for three-horsed draught $1\frac{1}{2}$ cwt. less is ordered to be carried than was formerly carried with two-horsed draught.

Hence it is evident what decisive steps have been taken to increase the mobility of our train.

(2.) *Personnel of the Divisional Train.*—Special tables and establishments for the Divisional train have been drawn up. (1), for an infantry Division (with deviations to meet the peculiarities of the composition of the train of the Divisions numbered from 42 to 65²); (2), for the 1st Guard Cavalry Division; (3), for the 2nd Guard Cavalry Division; (4), for the remaining Cavalry Divisions; and (5), for a rifle brigade.

For each Division (and rifle brigade) there have been drawn up separately: first, the tables and establishments of the Staff and general section, and then those of the expense and reserve transports, and finally the total number of all ranks, of the vehicles and horses of the whole Divisional train. The hospital section is not included, as its establishments and tables will be fixed by the special regulations for the medical establishments.

Each table of establishments shows separately the personnel, vehicles, and horses of each subdivision, and where there are no subdivisions—the special vehicles, with the men and horses belonging to them for each regiment, independent battalion and battery.³ The duty of each person is shown, so that it can at once be seen what he is wanted for.

(3.) *Horses.*—The ration for the horses is fixed at the same rate as in the regimental train, i.e., at the rate of $13\frac{1}{2}$ lbs. oats and $13\frac{1}{2}$ lbs. hay per day. In addition to the draught horses there are also detailed: (a), spare horses 10 per cent.; (b), horse reserve of the Division, ten horses per regiment and per battery; (c), Government riding horses for all Officers and officials, and for some non-commissioned officers.

The principal data of the tables and establishments are given below.

¹ During the war of 1877-78 many corps harnessed their vehicles with 4 horses, and then loaded them with as much as they would hold. The vehicles stood it.

² i.e., Reserve Divisions.—TR.

³ The nature and quantity of the stores are shown in the tables, also for each independent unit separately.

I. *Divisional Train of an Infantry Division.*(1.) *Staff of the whole Train and General Section.*

	Subdivisions of the General Section. ¹					
	1st.	2nd.	3rd.	4th.	5th.	6th.
	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
1. Field church.....	16	—	—	—	—	—
2. Intrenching tools, viz., 160 shovels, 48 picks, 48 mattocks, 384 axes, and 16 crowbars per regiment. In the artillery the tools are with the batteries. In the 6th Subdivision they are on the train men: half with axes, half with shovels.....	31	31	31	31	—	—
3. Made-up clothing, 68 suits per regiment, 24 per artillery brigade, and 40 for Divisional train.....	7½	7½	7½	7½	2½	4½
4. Field tailor's shop (material for repair and renewal of clothing).....	2½	2½	2½	2½	1	1
5. Boots, 544 pairs per regiment, 192 per artillery brigade, and 96 for Divisional train...	15½	15½	15½	15½	5½	2¾
6. Material and tools for repair of boots.....	In the regimental train ¾					
7. Pack saddle gear (Diterich's system), 40 per regiment, 21 per artillery brigade.....	9½	9½	9½	9½	5	—
8. Reserve horse-shoes and nails for 150 horses per regiment, and artillery brigade, and for 1,200 horses per Divisional train.....	7½	7½	7½	7½	7½	57½
9. Horse reserve of the division (10 horses per regiment and battery), total 100 horses. Spare harness on half of them.....	..	..	..	..	..	(100 horses)
10. Picketing gear for horse reserve.....	..	..	..	..	..	2½
11. Baggage of personnel of Staff of Divisional train and general section ².....	..	..	..	..	..	35½
Total.....	89	73	73	73	21½	104½
Vehicles—3-horsed.....	9	7	7	7	2	9
" 2-wheeled carts ³.....	..	..	..	..	..	3
Horses—Draught.....	27	21	21	21	6	30
" Spare.....	2	2	2	2	..	102½
" Riding.....	..	..	..	..	..	8
Officers and officials ⁵.....	..	..	..	..	..	6

¹ It is to be recollected that the 1st to 4th subdivisions are for the corresponding regiments, the 5th for the artillery brigade, the 6th for the whole of the Divisional train and for the Divisional staff.

² Viz.: Supplies, kettles, treasury, office, field companion and medical appliances, veterinary field companion, tools, and materials for shoeing horses, for repair of train and harness, reserve of boots and Officers' baggage.

³ Apothecary's cart, sanitary cart, and cart for Commander of Divisional train.

⁴ Including 100 horses for the horse reserve of the Division.

⁵ The Commander of the Divisional train, Adjutant, official for correspondence, Commander of general section, and two Surgeons (one of them a Veterinary Surgeon).

Staff of the whole Train and General Section—continued.

	Subdivisions of the General Section.					
	1st.	2nd.	3rd.	4th.	5th.	6th.
Rank and file—						
Sergeant-major and quartermaster sergeant ...	..	..	..	..	..	2
Sectional N.C.O.	1	1	1	1	..	1
Dressers, 5; clerks, 4; artificers, 10; for interior economy, 2. Total .....	..	..	..	..	..	21
Train soldiers	10	8	8	8	2	63

The Staff of the Divisional train and the general section thus comprises 433½ cwt. of baggage, 44 vehicles (including 3 two-wheeled carts), 244 horses, 3 Officers, 3 officials, and 127 rank and file.

(2.) Expense Transport.

	Subdivisions.					
	1st.	2nd.	3rd.	4th.	5th.	6th.
(a.) Provision supplies of the troops of the Division	For 4,000 men			for 1,500 men		
	in each subdivision.					
Biscuits and groats for 4 days, salt for 8 days, tea and sugar for 10 days; total weight	351½ cwt.			132 cwt.		
	in each subdivision.					
(b.) Baggage of personnel of the transport ...	cwt. 5¾	cwt. 2	cwt. 5¾	cwt. 2	cwt. 1	cwt. 29¼
Total cwt.....	357¼	353½	357¼	353½	133	161¼
Vehicles, 3-horsed	31	31	31	31	12	14
Horses—Draught	93	93	93	93	36	42
„ Spare	9	9	9	9	4	4
„ Riding.....	2	1	2	1	1	5
Officers and officials	1	..	1	..	..	3
Rank and file—						
Sergeant-major and quartermaster-sergeant..	1	..	1	..	..	2
Sectional N.C.O.....	1	1	1	1	1	1
1 hospital dresser, 2 farriers, 3 clerks.....	..	..	..	..	..	6
Privates for interior economy	3	..	3	..	..	4
Artificers	1	1	1	1	1	12
Train soldiers	35	35	35	35	14	16

Total of the expense transport: 1,718 cwt. of baggage, 150 vehicles, 506 horses, 4 Officers, 1 official, and 213 rank and file.

As has been explained, each pair of subdivisions is commanded by an Officer with the powers of a company commander. The Officers are borne on the strength of the 1st, 3rd, and 6th subdivisions, hence the difference in the weight of baggage, the number of men, and of riding horses, compared with the 2nd, 4th, and 5th subdivisions. The commanders of the 1st and 2nd, 3rd and 4th subdivisions have under their orders 78 rank and file, 62 vehicles, and 207 horses; the commander of the 5th and 6th subdivisions 57 rank and file, 26 vehicles, and 92 horses.

(3.) *Reserve Transport.*

	Subdivisions.					
	1st.	2nd.	3rd.	4th.	5th.	6th.
(a.) Similar provisions in similar quantity and for the same number of men as in the expense transport	351½ cwt.			132 cwt.		
	in each subdivision.					
(b.) Three days' reserve of oats for the establishment of horses of the transport itself, to feed them on the way to the expense magazine and back (besides a 3 days' supply, which is laid down to be carried in each vehicle)	36 cwt. in each subdivision.			13 cwt.	19½ cwt.	
Baggage of the personnel.....	6	2	6	2	1	31½
Total cwt.....	393½	389½	393½	389½	146	183½
Vehicles, 3-horsed.....	34	34	34	34	13	16
Horses—Draught	102	102	102	102	39	48
" Spare.....	10	10	10	10	4	4
" Riding.....	2	1	2	1	1	6
Officers and officials	1	..	1	..	..	4
Rank and file—						
Serjeant-major and 3 quartermaster-sergeants	1	..	1	..	..	2
Sectional N.C.O.	1	1	1	1	1	1
1 dresser, 2 farriers, 3 clerks .....	..	..	..	..	..	6
Privates for interior economy	3	..	3	..	..	4
Artificers.....	1	1	1	1	1	12
Train soldiers	39	39	39	39	15	18

Total in the reserve transport baggage 1,895½ cwt., vehicles 165, horses 556, Officers 4, officials 2, rank and file 232.

Command of subdivisions as in the expense transport.

(4.) *Total Divisional Train of an Infantry Division.*

	Staff and general section.	Expense transport.	Reserve transport.	Total.
Field Officers	1	..	..	1
Officers	2	4	4	10
Surgeons	1	..	..	1
Veterinary Surgeons	1	..	1	2
Officials	1	1	1	3
Total	6	5	6	17
Rank and file	126	213	232	571
Vehicles	44 ¹	150	165	359
Horses	244	506	556	1306

The sanitary section is not included in this, as the establishments and tables, although ready, are not yet finally sanctioned. It consists of—

(a.) A Divisional lazaret of 3 two-wheeled carts, 15 two-horsed and 9 four-horsed (8 hospital *linéikas* and 1 large wagon for tents) wagons; total, 27 vehicles and 71 horses (including 2 riding horses).

(b.) Of two Divisional hospitals, each of 200 soldiers, and 10 Officers' beds. In both there are 4 carts, 36 pair-horsed and 4 four-horsed wagons; total, 44 vehicles and 100 horses (including 6 spare and 2 riding).

Consequently in the whole medical section there are 71 vehicles and 171 horses.

To give a concrete idea of the dimensions of the train and of the depth occupied by a whole infantry Division marching on one road, the following table is appended:—

	Vehicles.	Horses.	Depth in paces.
I. <i>Troops and train of 1st line—</i>			
Leading battalion of 1st Regiment .....	..	..	350
Interval .....	..	..	50
First heavy battery, with all wagons, reserve carriage, and train of 1st line ..	2 ²	8	600
Interval .....	..	..	50
Remaining 3 battalions of 1st Regiment (and two intervals of 50 paces each) ...	..	..	1,200
Interval .....	..	..	25
Train of 1st line of 1st Regiment	23	40	150
Interval .....	..	..	100
2nd Regiment with train of 1st line, having the 2nd heavy battery with train of 1st line in rear of leading battalion..	25	48	2,425

¹ Including 3 two-wheeled carts.

² One hospital *linéika* and artillery wagon.

	Vehicles.	Horses.	Depth in paces.
<i>Troops and train of 1st line, continued—</i>			
Interval between brigades .....	..	..	200
3rd Regiment, with train of 1st line.....	23	40	1,725
Interval.....	..	..	100
Four light batteries with brigade staff and train of 1st line	9 ¹	24	2,150
Interval .....	..	..	100
4th Regiment and train of 1st line.....	23	40	1,725
Total of Division and train of 1st line....	105	200	10,950 (5 miles)
II. Interval according to regulation for the regimental train .....	..	..	500
III. Train of 2nd line—			
Of Divisional Staff and of Commander of 1st Brigade (with interval of 25 paces)..	6	14	100
Of 1st Regiment	63	111	600
Interval.....	..	..	25
Of 1st heavy battery	7	16	90
Interval.....	..	..	25
Of 2nd Regiment	63	111	600
Interval.....	..	..	25
Of 2nd heavy battery.....	7	16	90
Interval.....	..	..	25
Wagon of Commander of 2nd Brigade ...	1	2	15
Of 3rd Regiment.....	63	111	600
Interval.....	..	..	25
Of Staff of Artillery Brigade and of 4 light batteries.....	33	74	400
Interval.....	..	..	25
Of 4th Regiment.....	63	111	600
Total train of 2nd line of Infantry Divi- sion	312	566	3,245 (over 1½ miles)

Consequently a Division with all the regimental train will occupy in depth (infantry in sections or in fours, artillery in column of route, train in column of route, carts two abreast) $6\frac{2}{3}$ miles, and allowing for drawing out 10 miles, or half a day's march.

¹ The remaining 4 artillery wagons, and 1 *linéika* and 4 carts (viz., 2 pharmacy, 1 medical, and 1 cart for the Officer commanding the brigade).

(1.)
regim
Staff.
(2.)
10 pa
staff.
(3.)
regim

	Vehicles.	Horses.	Depth in paces
<i>IV. Order of March and Depth of Column of</i>			
<i>Divisional train—</i>			
Train of 3rd line—			
Divisional lazaret	27	71	300
Interval .....	..	..	25
Two Divisional hospitals (25 paces interval between them)	44	100	550
Interval .....	..	..	25
Staff and general section of Divisional train	44	244	700
Interval .....	..	..	25
Expense transport	150	506	1,900
Interval .....	..	..	25
Reserve transport	165	556	2,100
Total train of 3rd line of Infantry Division (Divisional train)	430	1,477	5,650 (nearly 2½ miles)

Consequently an infantry Division with all its transport will occupy 9½ miles in depth, if the train of 3rd line can follow immediately after the 2nd line, but on the march it will draw out to 14½ miles, *i.e.*, a whole march. But the train of the 3rd line need not follow nearer than one day's march; if it always marches a day in rear of its Division, this is more than is required on the march.

In the majority of cases the train of the 3rd line will be less than above given. In the first place the Divisional lazaret and one mobile hospital will be, when an action is impending, at the head of the train of the 2nd line, and sometimes in that of the 1st line. Secondly, the reserve transport may not be with the Division at all, and if it is, it will be so very rarely all together. The greater portion of it will be always engaged in transporting sick and wounded to the rear, or in bringing up supplies from the magazines. Both causes will diminish the depth of the train of the 3rd line of the Division by nearly 2 miles, *i.e.*, by nearly one-half; while the depth of the train column of the 1st or 2nd line will be increased by the Divisional lazaret and one mobile hospital by only 600 paces.

II. Divisional Train of a Cavalry Division.

(1.) Staff and General Section.

(1.) Reserve of made-up clothing, 4 sets per squadron (none for a Cossack regiment), 4 per battery, and 10 for the whole Divisional train and Divisional Staff.

(2.) Made-up boots, 10 pairs per squadron (none for a Cossack regiment), 10 pairs per battery, and 20 for the whole Divisional train and Divisional staff.

(3.) Supply of horse-shoes and nails for 700 horses for each cuirassier regiment, for 1,000 horses for each dragoon and Cossack regiment, and for

regiment for 600 men (53 cwt.) ; for other regiments for 900 men (79 cwt.) ; for a battery of 180 men (nearly 16 cwt.) ; and for the whole Divisional train and for the Divisional staff also for 180 men (nearly 16 cwt.). In addition to this the baggage of the personnel of the transport itself is 18 cwt.

To carry this baggage there are : for a cuirassier regiment, 7 pair-horsed vehicles ; in other regiments, 10 ; for a battery, 2 ; and for the whole Divisional train and Divisional staff, 4 pair-horsed vehicles. The personnel of the transport consists of a Commander (Captain or Staff Captain), official for correspondence, sergeant-major, quartermaster-sergeant, train non-commissioned officers in command of the regimental vehicles (according to the number of regiments of the Division), and 1 non-commissioned officer in charge of the vehicles of the batteries, of the Divisional staff, and of the whole Divisional train, 1 medical dresser, and 1 farrier, 2 clerks, 2 privates for purposes of interior economy, 5 artificers, and train soldiers according to the number of vehicles and horses. Total :—

	Officers and officials.	Rank and file.	Vehicles.	Horses.
In 1st Guard Cavalry Division	2	84	58	137
In 2nd " "	2	99	72	167
In 1st to 14th Cavalry Divisions	2	72	48	113
In Caucasus Cavalry Division, in 1st and 2nd Caucasus and Don Cavalry Divi- sions, each				

3. Total Divisional Train of a Cavalry Division.

	Officers and officials.	Rank and file.	Vehicles.	Horses.
In 1st Guard Cavalry Division	8	188	87	297
In 2nd " "	8	210	108	342
In 1st to 14th Cavalry Divisions	8	157	73	240
In Caucasus Cavalry Division	8	158	74	242
In 1st and 2nd Caucasus and Don Cavalry Divisions	8	154	70	234

There is no medical section laid down for the Caucasus Divisions.

The dimensions of the train and the depth of column is only given here for an army cavalry Division (being sufficient by way of example).

	Vehicles.	Horses.	Depth in paces.
<i>I. Troops with train of 1st line.—</i>			
1st Dragoon Regiment in threes.....	—	—	1,330
Interval	—	—	25
Train of 1st line ¹	16	88	190
Interval	—	—	50
1st Horse Battery in column of route, with 6 wagons and spare carriage, numbers in rear of guns	—	—	400
Interval	—	—	25
Train of 1st line	3	20	45
Interval	—	—	100
2nd Dragoon Regiment with train of 1st line	16	88	1,545
Interval between brigades	—	—	200
3rd Dragoon Regiment with train of 1st line	16	88	1,545
Interval	—	—	50
2nd Horse Battery with train of 1st line ..	3	20	470
Interval	—	—	100
Cossack regiment	—	—	1,330
Interval	—	—	25
Train of 1st line	16	61	165
Total of Division with train of 1st line..	70	365	7,595 (3½ miles)
<i>II. Interval in accordance with regulations for regimental train</i>			
—	—	—	500
<i>III. Train of 2nd line of Divisional Staff and Commander of 1st Brigade.....</i>			
9	19	110	
Interval	—	—	25
Of 1st Dragoon Regiment	26	57	310
Interval	—	—	25
Of 1st Horse Battery	8	18	100
Interval	—	—	25
Of 2nd Dragoon Regiment.....	26	57	310
Interval	—	—	25
Of Commander of 2nd Brigade.....	1	2	15
Of 3rd Dragoon Regiment.....	26	57	310
Interval	—	—	25
Of 2nd Horse Battery.....	8	18	310
Interval	—	—	25
Of Cossack regiment	16	36	190
Total train of 2nd line of Cavalry Division	120	264	1,805 (nearly 1½ miles)

Consequently a cavalry Division with all its regimental train will occupy a length of 9,900 paces, or nearly $4\frac{1}{4}$ miles, and when extended on the march as much as $6\frac{1}{2}$ miles.

¹ Pair-horsed vehicles in column of route, 2-wheeled carts two abreast, led riding horses in threes (with the men in charge between each pair of horses).

	Vehicles.	Horses.	Depth in paces.
IV. <i>Train of 3rd line</i> (Divisional) one march in rear.—			
Staff of Divisional train and general section	25	127	300
Interval	—	—	25
Expense transport	48	113	575
Total train 3rd line	73	240	900

i.e., rather more than $\frac{1}{2}$ mile, and when extended $\frac{3}{4}$ mile.

III. *Brigade Train of Rifle Brigade.*

(1.) *Staff and General Section.*

(1.) Intrenching tools : for each battalion, 40 shovels, 12 picks, 12 mat-ticks, 96 axes, and 4 crowbars.

(2.) Made-up clothing : 16 sets per battalion, and 4 for the brigade train.

(3.) Materials for the renewal and repair of clothing for each battalion and for the brigade train.

(4.) Made-up boots : 128 pairs per battalion, and 10 pairs per brigade train.

(5.) Materials and tools for repair of boots, only for brigade train, at the same rate as for a company.

(6.) Supply of horse-shoes and nails : for 50 horses for each battalion, for 250 horses for the brigade train.

(7.) Pack-saddle gear, Diterich's system : 11 pack-saddle sets per battalion, according to the number of pair-horsed carts.

(8.) Horse reserve of the brigade, consisting of 12 horses, with spare harness on half of them.

(9.) Baggage of the personnel of the staff of the brigade train and of the general section.

Total : $16\frac{1}{4}$ cwt. per battalion, and $23\frac{3}{4}$ cwt. for the brigade train. To carry this there are 2 pair-horsed vehicles per battalion, and 3 for the brigade train.

Total establishment : 1 Officer, 1 official for correspondence, 28 rank and file, 11 vehicles, 39 horses (including 12 forming the horse reserve of the brigade, 2 spare, and 3 riding).

(2.) *Expense Transport.*

Biscuit and groats for 4 days, salt for 8 days, tea and sugar for 10 days for 1,000 men for each battalion, and for 100 men of the brigade train. In addition to this there is the baggage of the personnel. Total : 88 cwt. per battalion, and $13\frac{3}{4}$ cwt. for the brigade train. To carry this there are 11 pair-horsed vehicles per battalion, and 2 for the Divisional train. Total establishment : 1 Officer, 59 rank and file, 46 vehicles, and 105 horses (including 8 spare and 5 riding).

(3.) *Reserve Transport.*

This transport is capable of conveying a similar quantity of provisions, and an additional 3 days' supply of oats for the horses of the transport itself, to

feed them on the way to the expense magazines and on the return journey. Total : 96 cwt. per battalion, and (together with the baggage of the personnel) 16 cwt. for the brigade train. To carry the above there are 12 two-wheel vehicles per battalion, and 2 for the brigade train. Total establishment : 1 Officer, 63 rank and file, 50 vehicles, and 113 horses (including 8 spare and 5 riding).

(4.) *Total Brigade Train of a Rifle Brigade.*

3 Officers, 1 official, 150 rank and file, 107 vehicles, and 257 horses.

This train will occupy a depth, with intervals, of nearly 1,000 paces, or $\frac{1}{2}$ mile, and when extended on the march, $\frac{3}{4}$ mile.

The remainder of the article contains details of the temporary organization of the regimental and Divisional trains, which will hold good pending the transformation from the present system to that above described ; but as these are of mere temporary interest, it is needless to give them here. The regulations published in August, 1885, give full particulars of the new organization, and the translator will be happy to answer any questions which those interested in the matter may desire to address to him.

NOTICES OF BOOKS.

Tactical Studies from the Franco-German War of 1870-71. By Captain F. G. STONE, R.A. Kegan Paul, London. 1886. Pp. 174. Size 9" x 6" x 1½". Weight 1 lb. 10 ozs. Price 30s.

The aspiration "Oh, that mine enemy would write a book," might be judiciously supplemented by "Oh, that my friend would *not* write a preface." A reviewer is supposed to be absolutely above personal considerations, and to praise or condemn the works of friends or foes with equal impartiality; but the task is sometimes difficult, and especially so in the present case, owing to old and pleasant associations between author and reviewer. With regard to the work now before us, it is the preface which is the difficulty confronting the reviewer. Were it not for the preface we should treat the work as we should any of its predecessors from other pens, merely as a well-meaning attempt to solve or throw a light on complicated and difficult tactical problems; but Captain Stone claims practically for his book a far higher place in the literature of the war of 1870-71.

The author states that he has had the advantage of a "mass of reading and accumulated experience, acquired by long and careful study of the subject under favourable conditions," and that he has "spared no pains to render his work a reliable and valuable source of information to the student of military art." The selection of the battles "has been made with a view to bringing prominently forward the conduct of great battles in modern times, under conditions which are in each case illustrative of the application of tactical principles to almost every conceivable situation in which a General or Staff Officer is likely to find himself placed."

Captain Stone, therefore, himself sets up a standard, and that a high one, by which his work is to be judged. It is the duty of the reviewer to ascertain how far, therefore, the "Tactical Studies" are a reliable and valuable source of information, and how far they can be of use not merely to "Students of the Tactical Branch," but also to the higher troop leaders.

Unfortunately, Captain Stone, in his desire to place before the student the results of his own studies in the "most condensed form possible," has carried the condensing process to such a pitch as to deprive the book of much of the possible value and usefulness it might otherwise possess.

The defect inherent in condensation is that too often facts when condensed become half facts; truths, half truths; and it is when condensing tactical facts that the defect is so fully apparent. The study of tactics is essentially a study of details. Omit the details and we obtain merely worthless and misleading generalities whether we are Generals or only subalterns, and the most valuable lessons escape our notice. And even strategy may suffer from the condensation process, as evidenced by the so-called "Diary" in the "Tactical Studies." The effect of this process of condensation, as carried out by Captain Stone, will be best judged by a comparison of some of Captain Stone's "condensed" facts with the uncondensed original matter, and this comparison will enable our readers to form an idea of the nature of the book, and an estimate of its value to themselves.

P. 3. Condensed facts. "The fortress of Bitsch resisted *all attempts*¹ on the part of the *German Army*, compelling the troops on that road to move round by indifferent bye-ways."

Uncondensed facts. On the 8th August a Bavarian H.A. Battery threw some incendiary shells into the town (Official Account, p. 259, Sec. 4). On 23rd August, four 12-pr. rifled guns fired on the fortress for two hours (O.A., pp. 459-60, Sec. 9). On 11th September commenced a four days' bombardment from some 28 guns (O.A., pp. 129, 130, Sec. 19), but beyond these attempts and a partial investment, the Germans made no effort to take the fortress.

¹ The italics are our own.

P. 12. Condensed fact. "MacMahon commenced his march *northward with the view of retreating on Paris.*"

Uncondensed fact. "He (MacMahon) resolved to retire in a north-westerly direction before the advance of the Crown Prince, and thus still be able either to reach Paris in good time by a *détour*, or *advance to meet Marshal Bazaine*" (O.A., p. 186, Sec. 7).

P. 16. Condensed fact. "MacMahon was fully aware of the German numbers and positions on the 21st, and his flank march was undertaken with a full knowledge of the risk incurred."

Uncondensed fact. "The Marshal was therefore at this time well informed; only with respect to the supposed propinquity of the IIIrd Army was he *deceived* by the German Cavalry appearing at Vitry, which was some days ahead of the Army" (O.A., note, p. 187, Sec. 7).

P. 16. Condensed fact. "The Army of the Meuse changed front, with the object of moving in a northerly direction."

Uncondensed fact. The Army of the Meuse changed front with the object of moving in a north-easterly direction, so as to anticipate the French Army about Damvillers (O.A., pp. 244-5, Sec. 7).

P. 16. Condensed fact. The Saxons and 1st Bavarians are spoken of as the Corps which attacked the 5th French Corps at Beaumont.

Uncondensed fact. The surprise was effected by the IVth Army Corps, which took as prominent a part in the battle as the two mentioned (O.A., pp. 245, *et seq.*, Sec. 7).

Let us now turn to the effect of the condensation on the descriptions of the battles, and we will select Spichenen as an illustration. In $4\frac{1}{2}$ pages of wide-spaced print, with deep margins, are condensed the forty closely printed pages of the German Official Account of the Battle of Spichenen. Captain Stone rarely deals in this battle with a unit less than a brigade, which in the German Army numbers six battalions of four companies each, three battalions forming a regiment. What is the result? At p. 42 we read that at 2.30 P.M. the 27th Brigade reached the edge of the Gifert Wald, but from the details given, p. 215, Sec. 3, O.A., we find that the only troops of the brigade which were at the edge were the 2nd, 3rd, 5th, and 7th, and possibly the 6th Company of the 39th Regiment. "At the same time the right wing occupied Drathzug." The right wing of what? Certainly not that of the 27th Brigade, which was well into the Stiring Copse. But the full effect of condensing tactics will be best illustrated by the comparison given below. At p. 215, O.A., we read the following account of General v. François' advance to the Rotherberg:—

"Shortly after one o'clock General v. François led thither in person the two battalions of the 74th from the drill ground. To support this movement the three batteries were brought forward from the Winterberg to the Galgenberg. Although within the range of the enemy's musketry, they directed their fire on the troops on the Spichenen heights." . . . "He (the Officer commanding the leading battalion) deemed a direct ascent of the steep and rocky slopes impracticable without a corresponding flanking movement. Restraining the attempts of some of the more foolhardy, he ordered every man to get under cover below *the heights*, at the same time keeping up but a moderate fire upon the enemy's riflemen perched above them. As the enemy swept the *entire foot of the heights from his shelter-trenches*, which lined the edge of the precipice, cover was only to be obtained by crouching under *the rocky walls*. Meanwhile General v. François had returned to the 1st Battalion, which was following the Fusiliers at some little distance, and overlapping them on the right. It will be remembered that in consequence of intelligence from the right wing, the General had ordered the 1st and 2nd Companies into the Stiring Copse, and that the 3rd Company was also employed there, and partly towards the high road. The 4th Company had also been originally assigned a south-westerly direction; it afterwards received a contrary order to move towards the east side of the Rotherberg, with a view to supporting the débouché from the Gifert Forest. Without much loss the company reached the north-west corner of that forest, where it found protection against the enemy's projectiles under one of the *natural projecting terraces*, and took up the connection on the left with the 6th Company 39th Regiment; the 4th Company of the latter regiment, belonging

to the battalion in the Stiring Copse, which had just arrived on the drill ground, was also brought up towards the Rotherberg."

Now let us turn to the condensed account. "Soon after 1 P.M., General v. François led forward the remainder of the 27th Brigade to storm the Rotherberg; the fire of the French was, however, so severe that v. François was obliged to halt his force close under the heights, where it was under cover, owing to the *dense woods* which clothed the steep hill sides; the *lower edge of these woods* was not occupied by the French."

Let our readers compare the above, and they will admit that, even putting aside the substitution of dense woods for rocky terraces, we lose the whole point of the episode of the battle as teaching for Generals and Staff Officers, namely, the difficulty of leading under fire even two battalions to a decisive point in a battle-field.

As another example in the same battle we may take Captain Stone's treatment of the 28th Brigade. This brigade he treats as a whole; he never disintegrates it; and thus we lose one of the most valuable lessons of the battle. From pages 216, *et seq.*, of the Official Account, we collect the following details of the leading of the brigade.

The brigade was only five battalions strong. General v. Woyna, the brigadier, led his brigade from the railway bridge (not where the 27th Brigade crossed) by both sides of the railway towards the left of the French position, and then resolved to move against the enemy's left flank. With him went through the Stiring Forest the leading battalion, 1st, 53rd Regiment. The next battalion followed this movement with some difficulty through the thick underwood, *gradually losing contact with the leading battalion*. Half of the third battalion, 2nd and 3rd Companies, 77th, continued the turning movement with difficulty in the thick underwood; the other two companies went direct to the front along the railway. The fourth battalion, 2nd, 77th, was requested by an Officer they met to go to the Stiring Copse immediately in front of them, and they did so; whilst the rear battalion, for a similar reason, went away well off to the left, to the Golden Bremm and Baraque Mouton. Generals and Staff Officers can not only learn a good deal about the difficulties of leading in wooded ground from the above account, but they will fully sympathize with poor General v. Woyna, when somewhere about 5 P.M. he determined to withdraw his solitary battalion for the purpose of *first regaining the connection with the rest of the brigade*, and we are told at p. 220, "He was ignorant, however, of the fact that the latter had meanwhile been otherwise employed."

Of the remarkable, almost inexplicable, and sudden collapse of the French when apparently on the road to success on their left, at about 7 P.M., Captain Stone takes no notice, nor more than casually of the turning movement and attack on Forbach. The numbers he assigns to the Germans at the close of the battle are 50,000 men and 120 guns, whereas only 27 battalions, each certainly not above 900 strong, and 9 batteries, alone took part in the battle.

The battles of Wörth and Mars-la-Tour, which we have also examined, both suffer similarly; but the instances adduced are sufficient to illustrate the character of the work.

As regards giving a clear sequence of the events of the battle-field, we fail to see that Captain Stone has arrived at this desirable result. Of badly compiled accounts of battles, that of Wörth in the Official Account, is a glaring example, utterly unworthy of the German Staff, but Captain Stone has followed their lead in the treatment of the battle; and, further, in his narrative he has made the grave error of placing at 1 P.M. the XIth Corps round Gunstett and Spachbach. His own sketch (VI), which is a copy of the sketch opposite p. 178 (see Official Account), contradicts this statement, and this position is an important feature in the tactics of the battle. Numerous errata are there also in this work. The 2nd Cavalry Division did not take part in the Battle of Colombey, p. 10. There is no such unit as the 21st Brigade, VIth Army Corps, p. 24; nor as the 20th Cavalry Division shown at Tronville on the sketch of Mars-la-Tour 4 P.M.; neither does the 1st Battery of the 39th German Regiment exist, p. 50. We do not purpose dealing with the Donnybrooks of Gravelotte or Sedan, nor with Captain Stone's narratives and comments. We have no wish to be in the slightest degree sarcastic, when we say that for military or civilian readers who wish for a mere skeleton of the battles, and who are not particular about accuracy, and such readers of military

history are not a few, the book will be found of value; but for the classes for whom it is intended we doubt it will be of much use.—L. A. H.

Outlines of Military History. By COLONEL O. R. MIDDLETON, K.O.R.L. Regiment. Mitchell, London. Pp. 323. Size 9" x 6" x 1½". Weight under 2 lbs. 6 ozs. Price 21s.

The author gives in this work "a concise account of the principal campaigns in Europe between the years 1840 and 1870, being those generally referred to in our military text-books."

Unlike the author whose work has just been noticed, Colonel Middleton in his preface disarms criticism; for, he says, "In the following pages, the movements of the troops in the several campaigns under consideration are given in as concise a form as possible, and are not at all times *positively accurate*, but it is thought that they are sufficiently so to give a general idea of the strategy."

A writer on military history cannot expect that much confidence will be placed in him, or that much value will be attached to his work, when the first requirement of historical narrative, viz., accuracy, is avowedly absent. It would be no good for us to point out any inaccuracies in the work, such as exist even in the first 10 out of the 14 lines on the last page, for the reader would point to the words quoted from the preface. Still it takes away one's breath to read there that "after the capitulation of Metz, the 2nd Army was moved to Troyes, also to assist in covering the communications of the Germans; whilst the 1st Army occupied Metz and besieged some of the smaller fortresses. The French Army of the Loire consisted of upwards of 200,000 men. By December 18th (*sic*) they were completely broken up and driven into Switzerland." Shades of the Red Prince, v. Goeben, v. Werder, and v. Manteuffel, listen to this condensation of your triumphs! It is, however, very much to be regretted that so much labour, trouble, and expense, the latter as evidenced by the numerous maps and the way the book is got up, should have been spent to so little purpose.—L. A. H.

Burma, after the Conquest. By GRATTAN GEARY. Sampson Low, 1886. Pp. 345. Size 8" x 5½" x 1". Weight under 1 lb. 6 ozs. Price 7s. 6d.

The author of this very interesting work is the editor of the "Bombay Gazette." The conditions of the problem how to deal with Burma after the conquest could be best examined on the spot; and in order to learn the wishes and capabilities of the Burmese of the Upper Country and to learn about them, Mr. Geary went himself to Burma in December of last year. The tone of the book is moderate to a degree, and the work will repay careful perusal.

Exterior Ballistics of the Plane of Fire. By JAMES M. INGALLS, Captain 1st Artillery, U.S. Army Instructor. Van Nostrand, New York, 1866. Pp. 173. Size 9" x 6" x ¾". Weight under 1 lb. 6 ozs.

This work is intended primarily as a text-book for the use of the Officers under instruction at the U.S. Artillery School. The aim has been to present in one volume the various methods for calculating range tables and solving important problems relating to trajectories, which are in vogue at the present day, developed from the same point of view and with a uniform notation.

History of Gustavus Adolphus. By JOHN L. STEVENS. Bentley, London, 1885. Pp. 427. Size 9" x 6" x 1¾". Weight under 2 lbs. 2 ozs. Price 15s.

The author of this work was recently U.S. Minister at Stockholm, and he has read and carefully considered whatever might throw light on the character and career of Gustavus Adolphus. The volume is the result of his study of the best Swedish, German, French, and English writers on the subject and of conversations with Swedish scholars and statesmen.

India Revisited. By EDWIN ARNOLD. Trübner, London, 1886. Pp. 324. Size 7½" x 5½" x 1¼". Weight under 1 lb. 10 ozs. Price 7s. 6d.

This book is a diary and little more of a revisit to India. It is pleasantly and chattily written.

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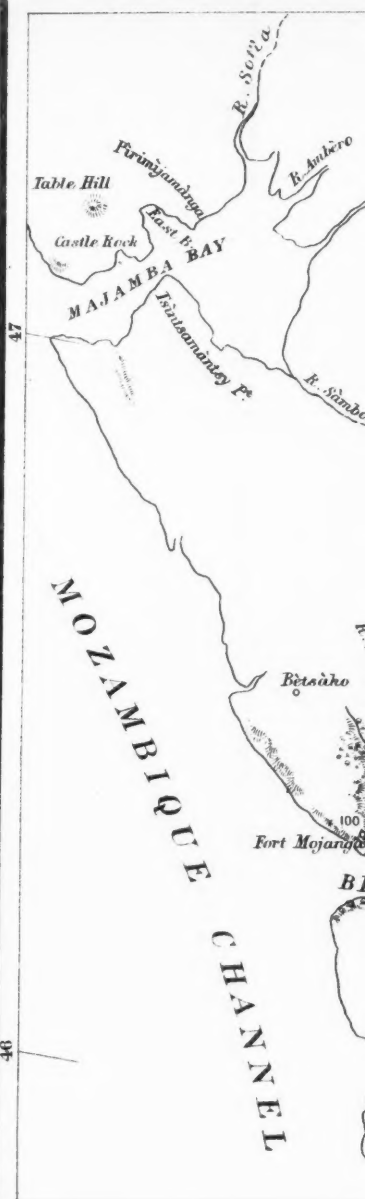
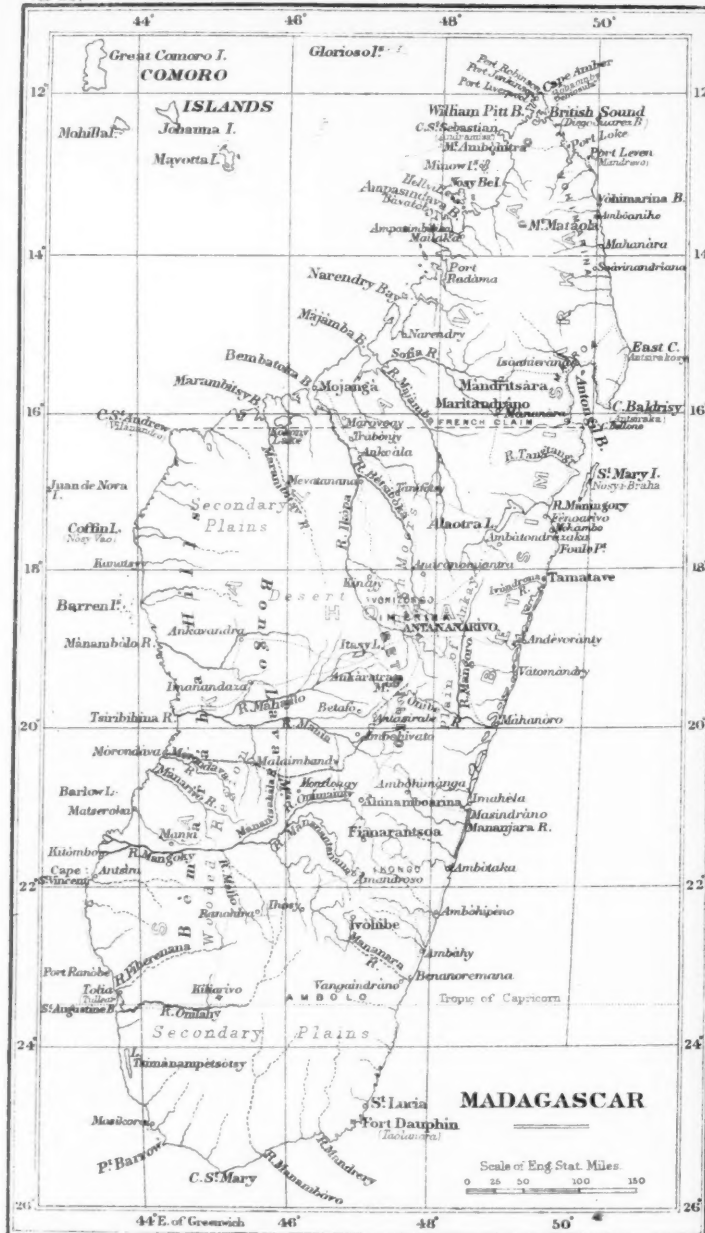
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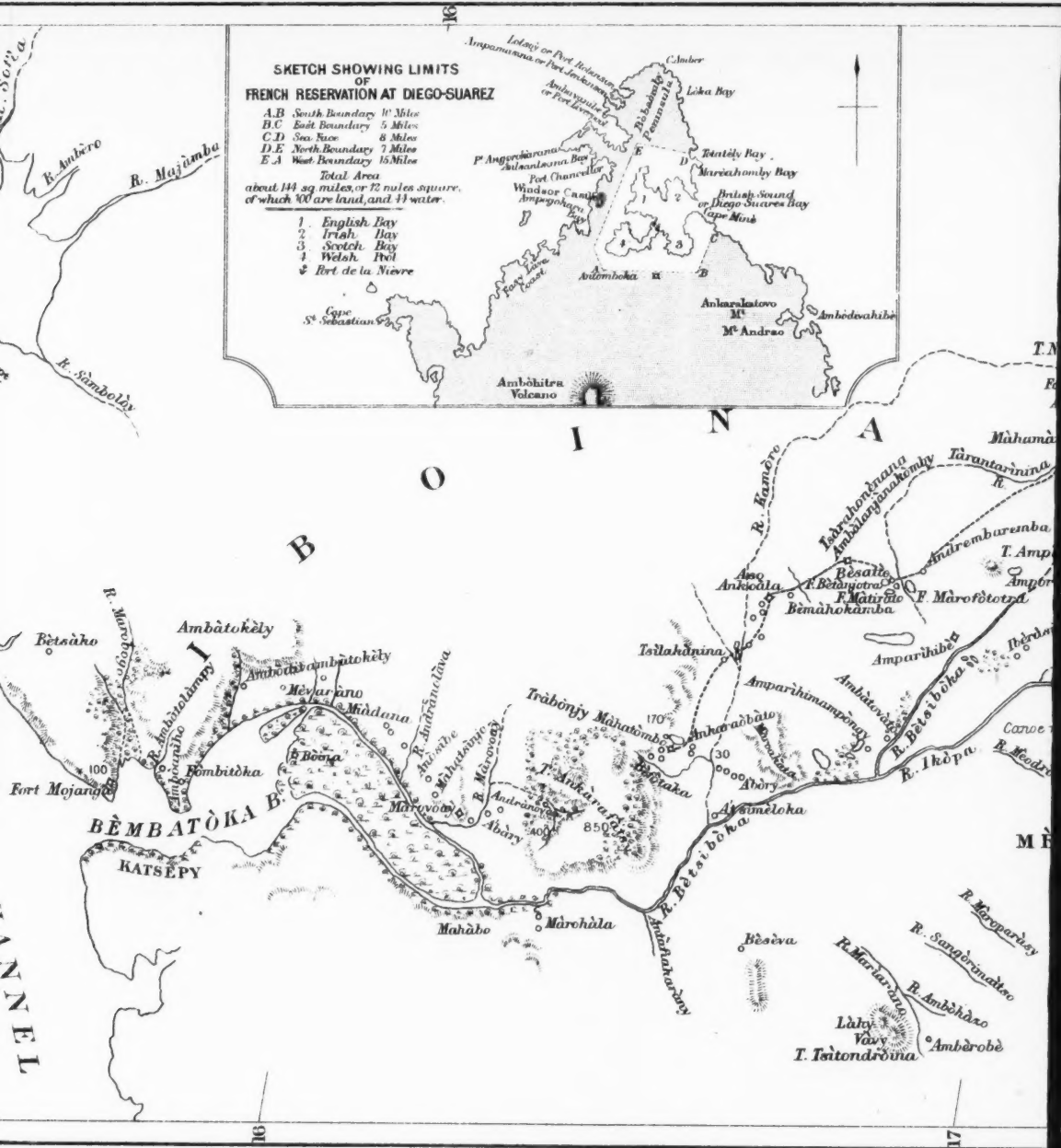


SKETCH SHOWING LIMITS
OF
FRENCH RESERVATION AT DIEGO-SUAREZ

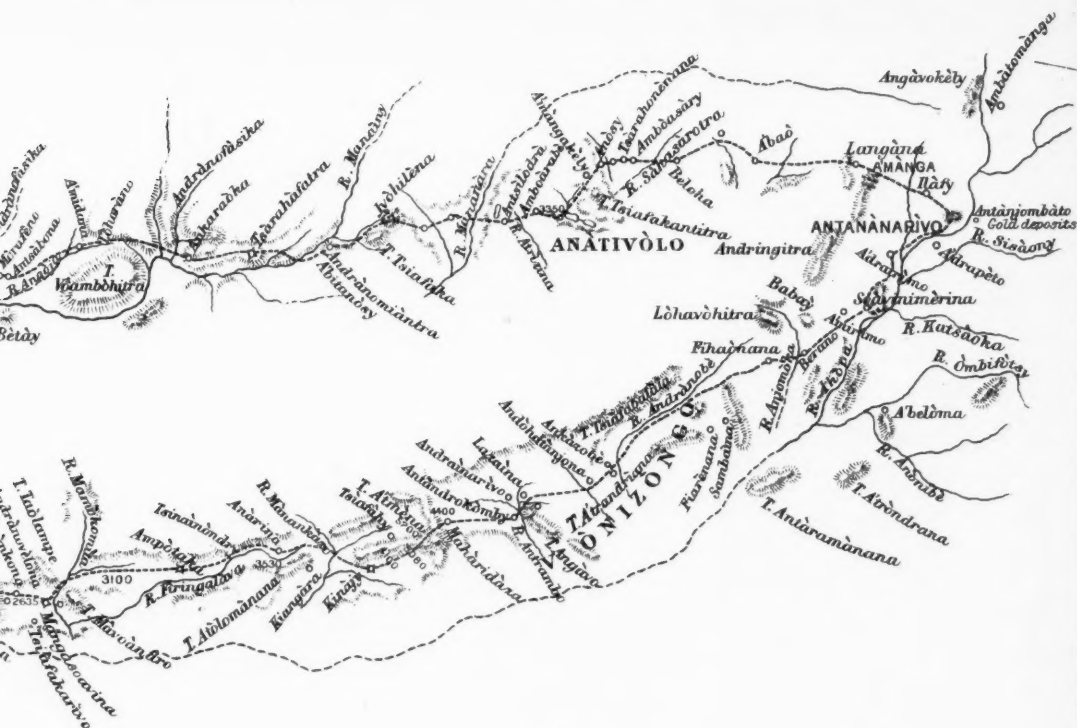
- A.B. South Boundary 10 Miles
B.C. East Boundary 5 Miles
C.D. Sea Base 8 Miles
D.E. North Boundary 7 Miles
E.A. West Boundary 15 Miles

Total Area
about 144 sq miles, or 72 miles square,
of which 100 are land, and 44 water.

1. English Bay
2. Irish Bay
3. Scotch Bay
4. Welsh Pool
& Port de la Nivree

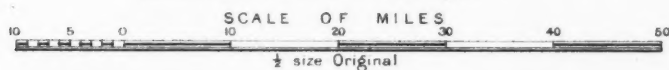






ROUTE FROM MOJANGÀ TO ANTANÀNARIVO

Drawn by Rajemisa in 1879 from positions and sketches by Vice-Consul W. C. Pickersgill.



Traced by Katharine R. Oliver.



NOTE.

The Editor has been requested by Lieut.-Col. Jelf, R.E., to state that in the discussion on Major Beresford's Paper on "Field Telegraphs," on 9th April, 1886, he inadvertently mentioned the *Welsh Regiment* as having sent him a useless Telegrapher in Bechuanaland; it was another Regiment altogether.